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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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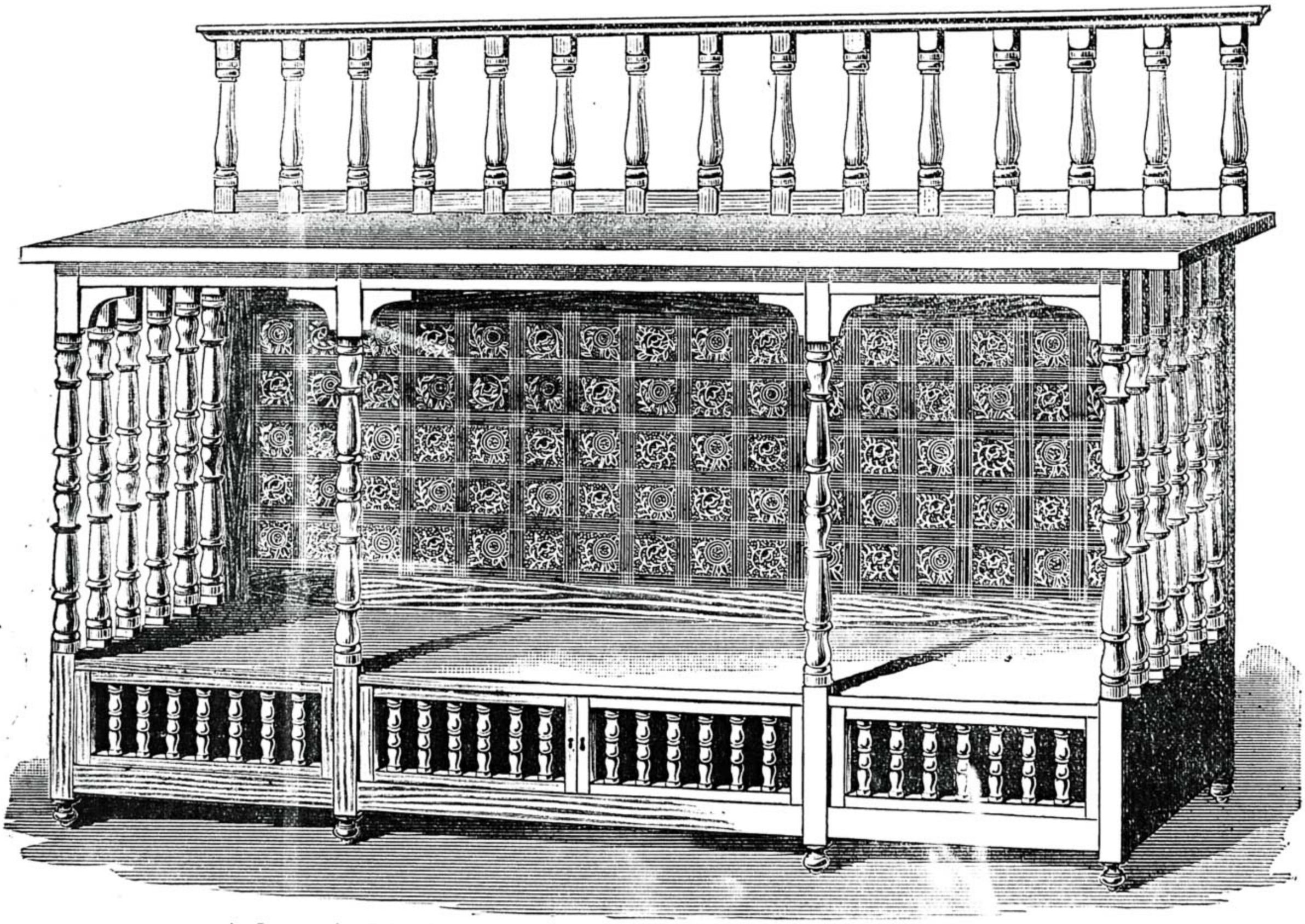

An Inexpensive Painted Sideboard or Dinner Waggon, constructed chiefly of Turned Balusters.

AN INEXPENSIVE PAINTED SIDEBOARD.

BY J. W. GLEESON-WHITE.

ELSEWHERE in the pages of WORK, the idea of using the turned balusters sold at so low a price by Messrs. M. C. Duffy, 61, Storks Road, London, E.C., and other firms has been mooted, with suggestions for their treatment. For these admirably worked pillars supply the amateur carpenter with honest decorative material that is easy to work and of lasting value, at a cost but a fraction over the raw material itself.

In the sideboard shown in the sketch, the balusters No. 1 cost in deal but 1s. 6d. the dozen, each one yielding two pieces the required length for the top. Fourteen of No. 43, costing 2s. the dozen, supply all the turning for the main storey. The cupboard doors are filled with spindles, costing 8s. to 12s. for the gross of twelve dozen, turned to one's own pattern. Thus taking the place of a greater quantity of solid material, they are practically as cheap as the lowest possible price for the rudest carpentry, yet the result is a piece of furniture that, if neatly finished, either ebonised, painted, or enamelled, is not unworthy a place in a middle class room.

On Messrs. Duffy's sheet of designs some 101 patterns are figured. All these are made also in pitch-pine or mahogany, the pitch-pine being double the cost of deal, the mahogany, which applies only to the larger numbers 73 to 101, costing, of course, considerably more.

The sideboard—or dinner waggon, for it lacks the larger cupboards which are usually embodied in a dining-room sideboard—offers no special difficulties of construction. In the papers on constructing various pieces of furniture that have already appeared in WORK, the mysteries of joints and fittings have been made clear. As this design is intended as a suggestive one rather than an exact pattern to be followed accurately, it seems needless to adopt the usual method of those who write herein, or to speak definitely and at length upon the framing of the carcase and the different features.

It is enough to show the rough idea of a piece of furniture that is chiefly built up with these balusters, and beyond lincrusta for a filling at the back, requires merely simple plain wood and a few machine-made mouldings to complete it.

The doors below, framed as for a panel, are filled with small turned spindles, either set in the round and lined with some material to exclude dust, or sawn in half and put on an ordinary panel, as a decorative

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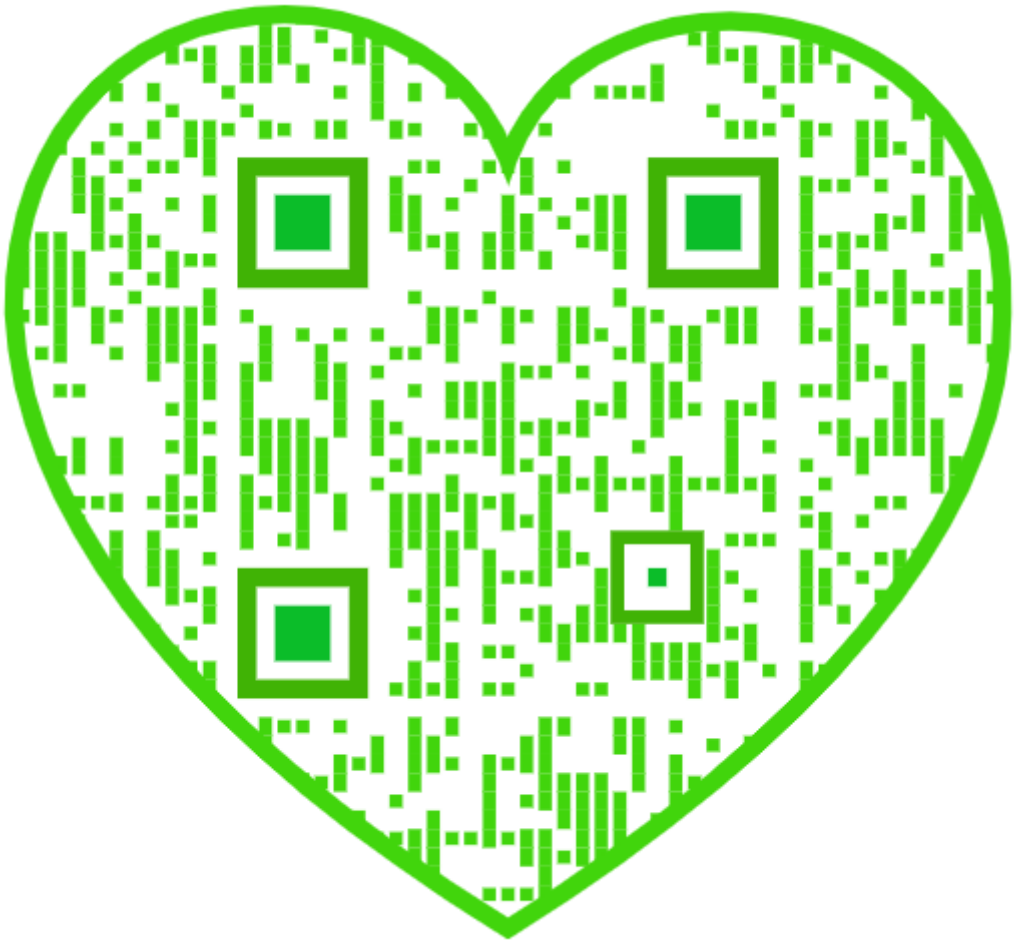

feature to carry out the idea of the whole thing.

If it is desired to add a second series of shelves below the main shelf, whether for the whole length or for the side pieces only, the designs kept in stock show many with a feature left unturned for such a purpose.

Where the cost of a few additional pence is not deemed an obstacle, much more elaborate patterns. such as Nos. 65 to 72, might be employed. These cost from 3½d. to 1s. 8d. each in deal, and 9½d. to 2s. 8½d. in pitch-pine, but these pieces are far more solid ones—1¾ in. to 2 in. in place of 1¼ in., as for the selected numbers; so that the six at each end would become unsightly, and half a dozen, at most, would replace the fourteen required.

But as the whole idea of the design is to obtain lightness, in a manner rather out of the hackneyed style, it is needless to go into details of alternative plans.

A HOME-MADE FISHING-ROD.

BY CONWAY LLANBEDR.

ALTHOUGH fishing-rods of good quality may be purchased for reasonable, and often very trifling, sums, there are, doubtless, many who would prefer to make their own. There is the man who likes to be able to say, "I made it myself, you know," and takes a double measure of enjoyment in using things which have been fashioned by himself, even though they may not be so handsome-looking as the ordinary articles of trade. Of course, a regular A1 fishing-rod is not the kind of thing I have in my mind while writing this, but still, a good serviceable rod will be the result, one which will do as well as anything else for pond or trout-fishing. It, or something similar, might answer for salmon-fishing, but I do not know, as I have never tried. I should also say that the rod is not intended to be portable, or, rather, that it does not take to pieces, though with a little ingenuity it might be made to satisfy requirements in this direction. However, as it stands, it is just the kind of thing which will be very useful to anyone living in the country, and not requiring to travel about with it. It is also a capital rod for boys, and as it only takes a short time to make, and the cost is almost *nil*, pater will easily be able to gratify the wishes of his young hopefuls who want to practise the gentle art.

Apart from the wood, about which more anon, the materials and tools are few and simple. Indeed, tools, in the ordinary sense, are not required, though they might be brought into use. I have, however, done very well with a penknife and glass-paper. Some thread or cotton is necessary for binding the parts together. Perhaps the best material is a kind of yarn or thread used by shoemakers, though it may not look as neat as silk. A piece of shoemakers' wax is also indispensable, and it can be got anywhere. A small piece of wire which can be easily bent will serve for the rings through which the line runs, but ordinary pins will do quite as well, and I have never used anything else in these home-made rods.

The wood of which the rod is made must now have a short space devoted to its consideration. Some pieces of thin flexible stuff will be necessary for the tip end of the rod. Cane, split strips of bamboo, whalebone, or anything of that kind will do admirably. Their length is unimportant, as, however short they are, they can easily be spliced together. The shorter the pieces, the more patience and labour required, that is all. Let us begin by making the tip or thin end. All that is necessary is to taper it down; and, before doing this, it will be just as well to exercise some judgment in selecting a nice flexible bit. It can easily be rounded and tapered off with a knife, and finished with glass-paper. The next piece will be prepared in the same manner, the only care necessary being to preserve the taper so that when the two pieces are joined together, there shall be no abrupt change from one thickness to another.

The joint is managed as follows. Bevel off an inch or two at the thick end of the thinner piece, and a corresponding length at the thin end of the other, so that they fit each other. Take a piece of the waxed thread and wind it evenly round both pieces of the rod covering the splice. The joint may be glued or cemented first, if preferred, but this is by no means necessary, and any risk of slipping may be avoided by just taking a turn or two of the thread round each piece separately at the splice before winding the thread round both together. The succeeding joints are all made in exactly the same manner, but, as the rod becomes thicker, it may be necessary to splice two or more pieces together

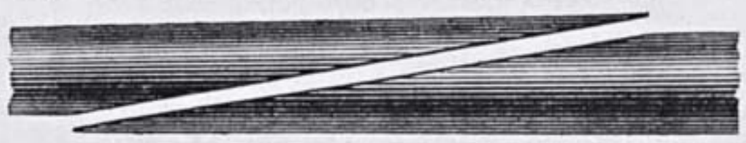

Fig. 1.

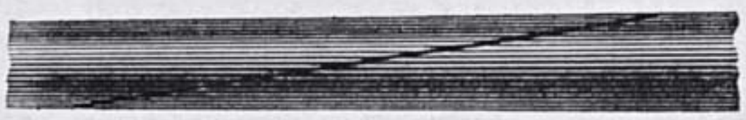

Fig. 2.

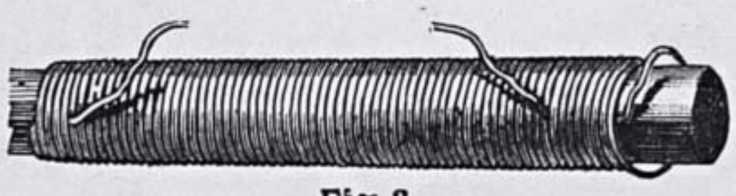

Fig. 3.

Fig. 1.—Ends of Wood bevelled for Splicing.
Fig. 2.—Ends fastened together in Position.
Fig. 3.—Mode of securing Ends of Thread.

throughout their length in order to obtain the necessary thickness. In this case, some cement or glue will be a convenience when tapering, but there is no absolute necessity for it. It will, however, be desirable to whip the pieces together with the waxed thread, at intervals of a few inches. At some of these places the pins, or other wire—pieces of hair-pins will do as well as anything—within which the line is to run can be bound in. The waxed thread will hold them perfectly secure. At the tip end another pin will, of course, be bent and secured in the same way.

It is not necessary for the whole of the rod to be spliced up in the way described. Towards the butt end, a stick of ash, or any other suitable wood, may be used solid, but, of course, tapered down to suit the remainder.

When completed, the rod may be advantageously coated with varnish, and, if sufficient care has been taken, not only a sightly but a useful fishing-rod will be the result. Nothing has been said about a reel, which is generally considered indispensable, but fish may be caught without it. Possibly on some other occasion I may suggest an arrangement to be used instead of a reel, and also give directions for making the rod in portions to render it more convenient for carriage in trains, etc.

Perhaps, to some who would like to make a fishing-rod as suggested, questions may arise as to length, both of the whole and of parts, method of cutting ends for splicing, and the way of fastening off the thread. To such people a few detailed directions, which, with the aid of accompanying illustrations, will no doubt make everything clear, may be given.

The total length of those I have made is from 9 ft. to 10 ft., which I believe is the usual, though I suppose there is no valid reason why it should not be more or less if required. For the waters I have fished in, the length named has, however, suited. The length of each piece has depended entirely on the material, and the way in which it would cut best. Of course, there is no occasion for all the pieces to be of the same length, but the shorter they are the greater the labour in making the rod, on account of the increased number of splices. While mentioning dimensions, it may not be amiss to say that the rod may taper from the thickness of an ordinary penholder, or even less, at one end, to sufficient to allow it to be comfortably grasped in the hand at the other, without making it too heavy or cumbersome.

The ends of the pieces for splicing are cut as shown in Fig. 1, from which it will be seen that the two bevels must fit each other so accurately, that were they placed together as shown in Fig. 2, they would, in fact, form one continuous piece. It may be well to note that a long bevel of, say, 1½ in., is better than a short one, as will easily be understood.

All we have now to do is to imagine the two pieces at the joint being held by the thread previously referred to. The only difficulty that can possibly arise to the veriest tyro is how to fasten the ends, a difficulty which, I think, will at once be removed by reference to Fig. 3, where the method is clearly shown. Of course, on finishing, the ends must be neatly cut off, and there will be no risk of the thread coming loose.

PARAFFIN LAMPS.

BY THOMASO.

SUSPENDING AND WEIGHTING HANGING LAMP—SNAKE LAMP OR HANGING LAMP ON STAND—ANOTHER FORM OF LAMP ON STAND—SNAKE SUPPORTS.

THE next lamp, Fig. 17, differs from Fig. 16 (page 696) only in the manner in which it is suspended. In the first hanging lamp described, I proceeded on the assumption that it was to be suspended from the remains of the gas chandelier. The lamp now under consideration can be suspended anywhere, provided a hook can be screwed into the ceiling.

I have already given directions for determining the proportions of the suspending wires. It is, therefore, only necessary to describe the casting at the top, and the weights.

Fig. 28 gives a view of the top casting half size, and Fig. 29 gives a full-sized view of one of the wheels in position, but the space between each pair of lugs is only approximate, being, of course, regulated by the width of the wheel. Be careful that all the lugs taper on all sides slightly, to allow the pattern to leave the sand easily. The taper (or strip) must be filed off the inner faces of the lugs when you get the casting, in order to prevent the edges of the wheels rubbing. Make the latter by cutting a strip of sheet-brass, rather wider than the chain, and make it into a ring. Solder this ring between two discs of brass of the size shown in Fig. 29, and drill a hole through the centre

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of both discs. Drill holes through the lugs where shown; place the wheel in position with a small washer each side, and then insert a piece of stout brass wire through the lot. To prevent it working out, solder one end to the lug. Drill holes through the two lugs on the other side of the casting, and insert two S-shaped hooks, joining them by another hook as shown in Fig. 17.

Now as to the weights. They are generally made of several segments of stamped brass soldered together, and filled with odds and ends of metal to very nearly the required weight, small shot being used for the final balancing.

If you have the chance of picking them up second-hand, by all means do so, as you would probably get them for considerably less than the cost of the brass stampings. Personally, I do not like the stamped brass weights. The pattern is generally one from which a South Sea Islander would turn in disdain; and the whole appearance is what only nasty sarcastic people would call ornamental. I do not mean to say that all the weights are like this, but the majority of those belonging to the cheaper chandeliers are; and they are the sort you are most likely to pick up second-hand. Before buying the weights, get some idea of their size by weighing the lamp, shade, etc.

Whether you buy or make the weights, carefully overhaul the hooks or rings by which they are attached to the chains. Neglect of this precaution may result in a weight crashing through the shade, and letting the whole concern down with a run; a result most astonishing to anyone sitting under it at the time.

So much for the stamped brass weights. They are scarcely suited for the lamp, on account of their tinselly look. Something of a solid appearance is necessary. For Fig. 17, I do not think you can do better than get a pair of "shells" of the same kind as those used for making the reservoir; but, of course, considerably smaller. Cut a 1 in. hole in one half to put the shot in, and make three holes equidistant at $\frac{1}{2}$ in. from the edge of the hole, and also make a hole in the centre of the other half.

Now get four of those little brass eyes used for holding the Venetian blind cord close to the window (Fig. 30); tin the ends; insert them through the holes in the shell, and solder carefully on the inside. We thus have three rings to attach the chain to, and one projecting from the bottom for a smoke consumer to hang from. This pair of shells must be joined in a different way to the others. Tap the edge of the top half inwards; tin both edges; put them together with the edge of the bottom half overlapping that of the top half, and solder firmly.

Fig 16 is weighted in the same manner, with the exception that the balls will be only half the size of that in Fig. 17, and will only need the 1 in. hole. The chain is hooked to a piece of wire bent like Fig. 31, the ends of which are soldered inside the ball.

If any difficulty should be experienced in getting the balls small enough (I know they can be got at Stanton's aforesaid), make the weights of sheet brass, the shape of a lobster tin, or clock weight, but of course, much smaller. If polished up nicely, they look very well. A piece of wire shaped like Fig. 31 is soldered on the inside to attach the chain to. When you are balancing the lamp, do not forget to three-parts fill the reservoir with oil.

The lamp is suspended from a steel screw hook, screwed into the ceiling. It is of no use screwing it into lath and plaster; you must hit on a joist. Notice the way the boards run in the room above, and the joists will be found at right angles. Make trial holes in the ceiling with a long thin awl, until you hit on the joist, and then screw in the hook nearly as far as it will go, for it looks bad to see it only about half-way in. It is not at all a bad idea to wear a pair of spectacles when doing anything to the ceiling; they protect the eyes from falling chips, etc.

Variety is charming when it is not costly. Bearing this in mind, I so designed the hanging lamp that the reservoir, burner, etc., could be taken out of the holder, and put on another form of stand, thus giving a totally different lamp at a slight extra cost.

In Figs. 32 and 33, two forms of the lamp are shown. All that is necessary to effect the change from the hanging lamp is to unscrew the ring at the bottom of the latter, thus releasing the reservoir, which is then put into the other holder or stand, as shown in the figures. Turning the reservoir round a few times screws it into A. The ring from the bottom of the hanging lamp is screwed on where shown in the figures, both to prevent it getting lost and to add to the appearance.

The ring to support the reservoir is made as before. The three legs have to be worked up from a casting. Fig. 34 gives a half size view of one pattern, a sort of conventionalised snake, "squared" for convenience of copying. Make the wood for the pattern of three thicknesses glued together, and dried under pressure. Two of the pieces are to be $\frac{1}{4}$ in. thick, with the grain running in the direction of the greatest length; and the third piece is to be $\frac{1}{8}$ in. thick, with the grain running across it, and is to be glued between the two $\frac{1}{4}$ in. pieces.

When dry, plane the wood down until it is of the section shown half size at the top of Fig. 34. Transfer the pattern to the wood and cut it out. Trim it up round in section, tapering the tail, which you will observe is joined to the body. The neck is made rather smaller in order to give a natural appearance. The wood not being thick enough for the head, small pieces must be glued on as shown. Make a slight depression to serve for the eye, and in the centre knock a short piece of a good-sized pin with the head on it. This will, of course, come out in the casting as a prominence, and when it is polished up (the rest of the eye being left rough) it looks very fierce indeed. Make a slight groove to indicate the mouth, but do not be tempted to make it with its mouth wide open—a very conventional idea, no doubt, but more suited to a belligerent Tom cat than a snake. Better not put any scale markings on the pattern. Think of the time it would take to finish up. Glue on the lug at the position shown and the pattern is done, except varnishing.

You can have either three or four of these supports to the lamp. With three the lamp stands firm on an uneven surface, and the cost and work in finishing is less; but with four you can use two of the snake's heads as handles to lift it by. This, however, is not the only way of carrying it, as I shall presently show.

A pattern like Fig. 35 must now be made of $\frac{1}{4}$ in. wood, care being taken to halve the arms into the circular part in the centre, and not to cut it all out of one piece. The length of the arms is got roughly in this manner:—On a piece of paper describe a circle half inch larger all round than the extreme diameter of the ring that supports the reservoir; put your pattern in the centre of this circle, and make the arms touch the circumference. The object of this casting is to steady the legs and provide means for securing the reservoir in place. Be careful that the arms are equidistant, or the legs will have to be bent out of the upright in order to get them to coincide with the arms.

Now make another pattern the size and shape of Fig. 36. It is circular, and will only cost a few pence to have turned if you have no lathe. The brass casting need not be turned unless you like. File and emery cloth will do very well, but it would, of course, be better turned, as the top could be made slightly concave, as shown by the dotted line, in order to correspond with the curved surface of the reservoir. Drill a hole in one end and tap it to fit the screw in the bottom of the reservoir, and cut a thread on the other end, as shown, of the same pitch.

Now finish up Fig. 35 and drill a hole in the centre large enough to admit the male screw of Fig. 36. Tin the surfaces that touch, and solder them together by heating the metal until the solder melts. An easier way would be to screw one into the other.

Drill $\frac{3}{16}$ in. holes in the snakes where shown at H in Fig. 34, taking care that the drill does not go right through, and that all the holes are of the same depth. These holes are to receive the ends of the arms of Fig. 35.

Solder the snakes in place, being very careful that they are all upright. Cut a circle of thin card of such a size that when placed in the position which Fig. 35 is to occupy its edge touches all the snakes just where you made the holes. Now strike three or four circles from the centre of this card disc, and then make a hole in the middle of it. Place Fig. 35 on it exactly in the centre (Fig. 36 having been soldered to Fig. 35, the hole in the card admits the projecting screw of Fig. 36)—the circles you struck will guide you—and then mark how much of the arms projects beyond the edge of the disc. If you find this amounts to more than the depth of the holes drilled in the snakes, you must file off the superfluous metal. Then file a shoulder on the projecting part of the arms as shown at A, Fig. 35, to just fit the holes in the snakes.

Drill holes for the rivets to secure the snakes to the ring; make marks on them and corresponding ones on the ring to prevent confusion, and then unsolder them. Clean off the solder, put Fig 35 in place, and then rivet the snakes on with copper rivets.

Try the reservoir: if it will not screw into Fig. 36 it is because the measurements have been taken carelessly. The only way to remedy it is to bend one of the arms of Fig. 35 slightly, thus throwing Fig. 36 a little out of the upright, and probably allowing the reservoir to be screwed into it.

Drill a small hole through the snakes where the arms of Fig. 35 enter them in such a manner that you drill through both snake and arm. File a piece of brass wire slightly tapering to fit this hole, and tap it in firmly with a light hammer and cut off the projecting ends. This renders the whole thing rigid. Polish and burnish as usual.

A shade can be made in the same manner as described for the hanging lamp, or a glass one can be used. The size is the same as that for the reading lamp first described. If made of tin or card it may be larger, but not as large as the hanging-lamp shade. That would give it a top-heavy look.

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Make the rim for the shade of the ½ in. by $\frac{1}{16}$ in. flat wire. In order to get the exact shape of the supporting wires, make a drawing of the upper part of the lamp, in the same manner as you did to get the shape of the arms of the hanging lamp, only instead of drawing *that* arm you will draw the outline of one of the wires that are to support the shade. Cut three lengths of ⅛ in. brass wire, allowing for the piece that goes into the holes in the top of the reservoir, and also ⅛ in. to permit of their being riveted into the rim or gallery. Bend all the wires to the shape drawn on the paper, file a shoulder on ⅛ in. of the upper ends, drill holes in the gallery to admit the shoulders, insert and rivet over on the inside lightly, put the whole into position on the lamp, giving the wires a twist here and there to get them straight, and then, without moving it, solder the wires firmly on the inside of the ring. The shape of the wires does not matter particularly. That shown in the figure looks very well. If you want to use a globe you must make a gallery to support it, by getting a stout piece of sheet brass and cutting a hole in the centre just large enough to allow it to slip over the clips, which must be bent inwards for the purpose, and rest on the projection indicated by the arrow in Fig. 2 (page 480). A strip of brass, which may be fashioned something like that which will be found in Fig. 37 (which shows the whole arrangement), should be soldered all round as shown, soldering on the under side. The globe must fit easily.

Peradventure there are some who dislike snakes both dead and alive. Perhaps Fig. 33 may take their fancy.

The shape of one of the legs will be given in Fig. 38 half size. It is a very easy pattern to make. Cut a piece of wood to the outline, and on each side glue a narrow strip of the same wood. Glue little bits on to form the "toes" and also to make the top round with a bevelled edge. Reduce the size of the leg just under the round part and cut a piece out of the top, as will be shown at A, Fig. 38, to fit the curve of the ring.

It is not intended to have lugs on these legs, but to screw them to the ring from the inside, using two screws to each, having heads like wood screws and well countersunk. The countersinking of the holes inside the ring is easily managed by taking a large size sharp drill bit in the hand and twisting it round in the hole.

Solder the legs on and mark the positions of the holes for the screws. Unsolder them, drill (not quite through) and tap, and after finishing up, screw them on. It is best to only burnish up the edges and other prominent parts of these legs, and blacken the other part carefully with gold size and lamp black, thinned with a little turps.

There are two ways in which Fig 35 can be attached to the legs. You can either make the ends of the arms like B, securing them with a pin through as shown, or you can have a little lump of metal cast on, as will be shown at B, Fig. 38, and make the ends of the arms like A, Fig. 35, securing them as usual. In the former case it will not be necessary to take the legs off to fit Fig. 35.

When carrying the two lamps last described you open your hand palm upwards, thread Fig. 36 between the second and third fingers, and then lift.

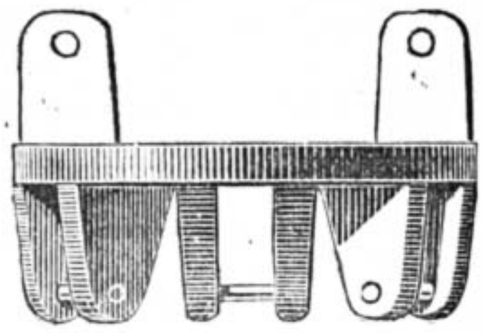


Fig. 28.

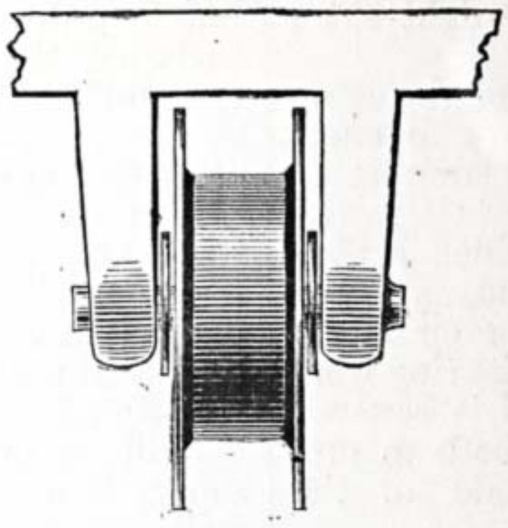


Fig. 29.

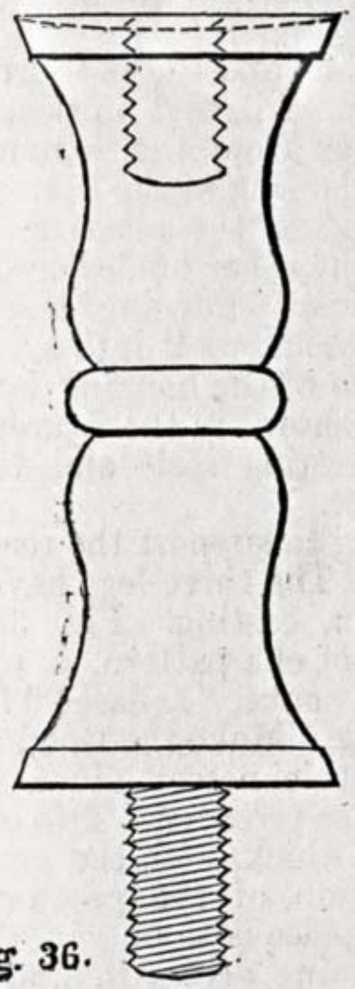


Fig. 36.

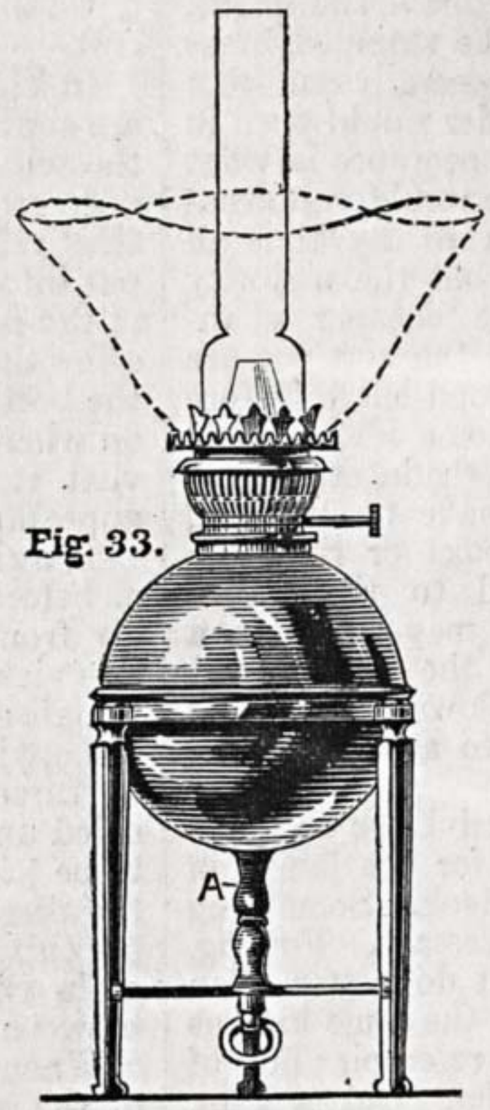


Fig. 33.

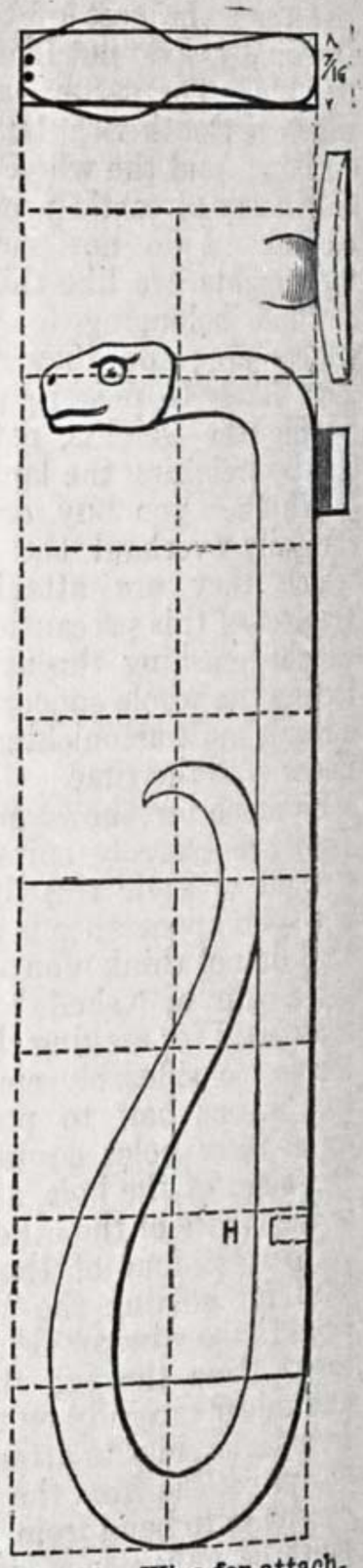


Fig. 34

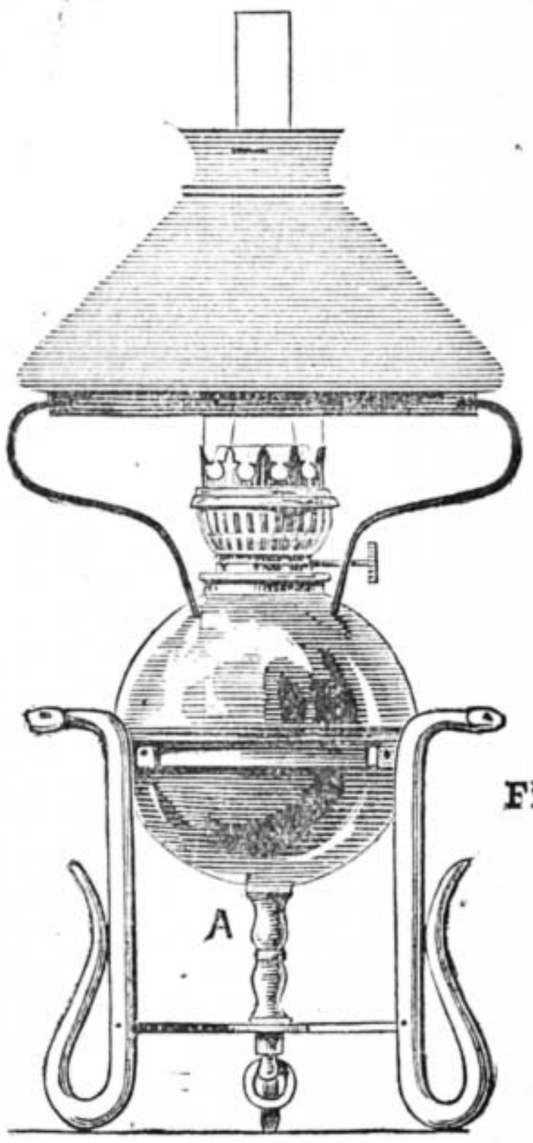
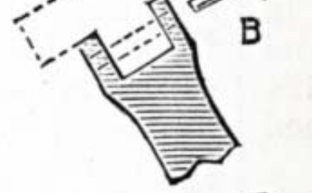


Fig. 32.



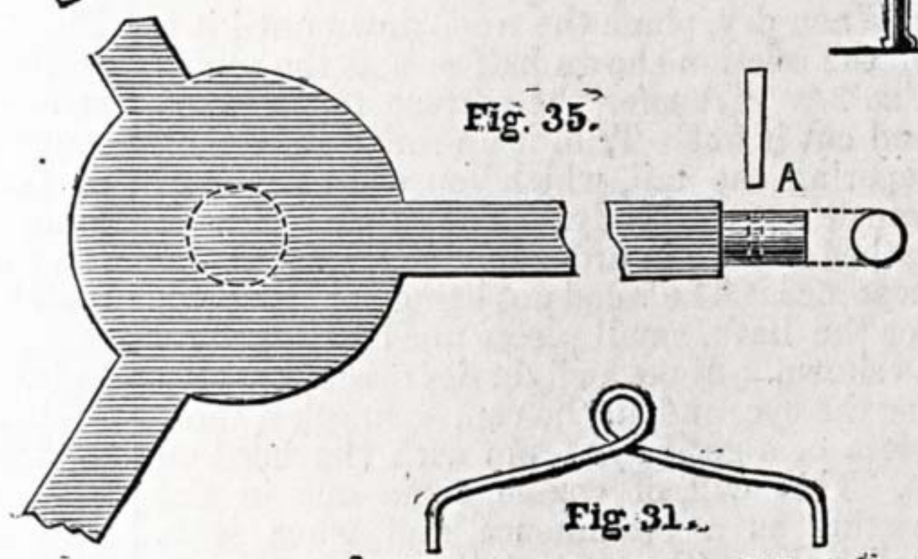


Fig. 35.

Fig. 31.

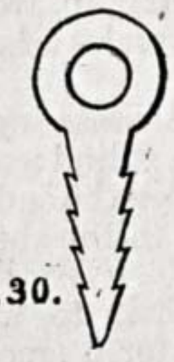


Fig. 30.

Fig. 28.—Casting at top of Fig. 17 (half size). Fig. 29.—Wheel in Position between Lugs (full size). Fig. 30.—Eye (full size). Fig. 31.—Wire for attachment of Chain. Fig. 32.—Snake Lamp fitted with Shade. Fig. 33.—Alternative Form of Fig. 32, fitted with Gallery to hold Globe. Fig. 34.—Snake Support for Fig. 32 (half size). Fig. 35.—Struts for Figs. 32, 33 (full size). Fig. 36.—Enlarged Diagram of A, Figs. 32, 33.

MODERN FORGING.

BY J. H.

Formation of Bolts and Swivels.

Bolts and nuts are bought more cheaply than they can be forged in small quantities, and they are consequently seldom made in little workshops, unless they happen to be required of special dimensions, or, not being in stock, are yet urgently wanted. It may therefore seem that their description would be superfluous in these articles. But such is not the case, because, by introducing a description of the methods adopted in their formation, I shall be able to illustrate several facts which find useful application in other classes of work besides these simple examples.

To make bolts there is choice of three available methods. In one, a bar is selected of about the size of the bolt head across the angles, and the stem is drawn down, first roughly by the hammer, and then completed between swages. This method is not often followed, unless the bolt happens to be very short, because of the labour involved in the drawing down from a large bar and finishing neatly to the required diameter. Though, with a steam hammer, such a method would be occasionally resorted to, it would very seldom be adopted by a man who works without its aid.

Another method, also seldom adopted, would be to take a bar of the diameter of the bolt and upset a mass of metal to form the head.

The usual method selected is that by

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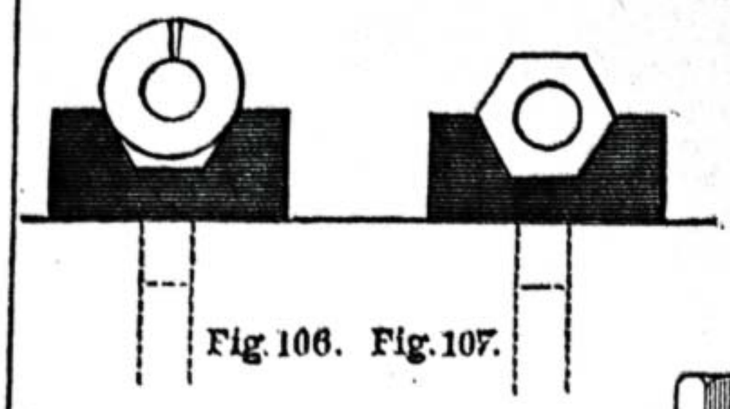


Fig. 106. Fig. 107.

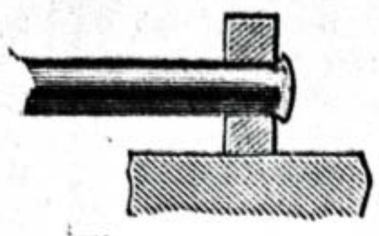


Fig. 105.

Fig. 103.

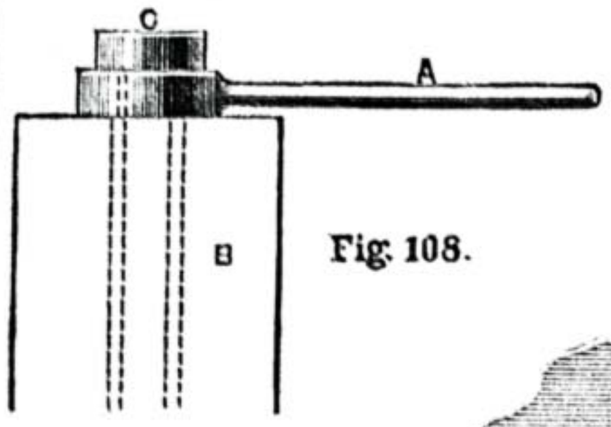


Fig. 108.

Fig 110.

Fig. 109.

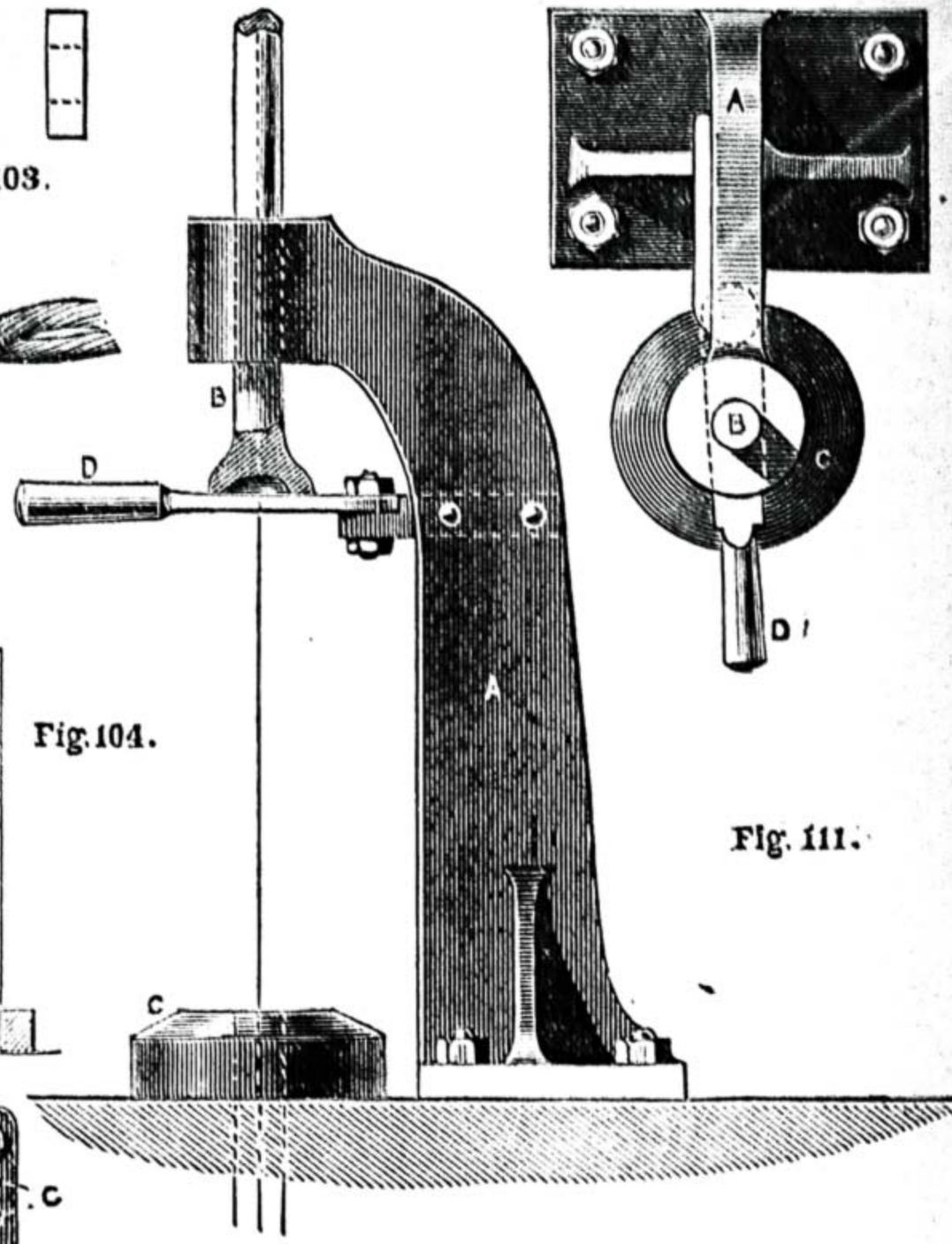


Fig. 111.

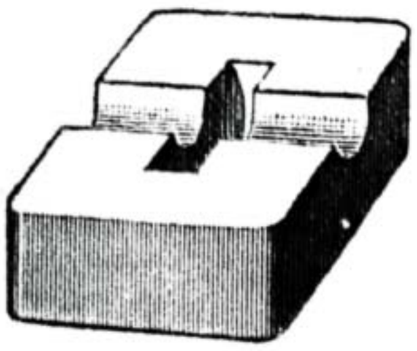


Fig. 112.

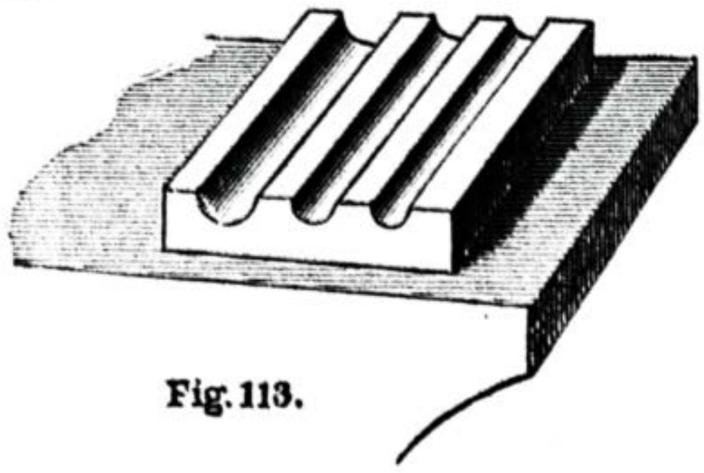


Fig. 113.

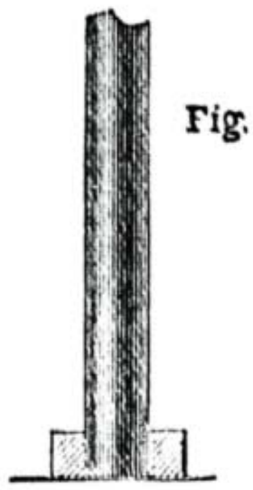


Fig. 104.

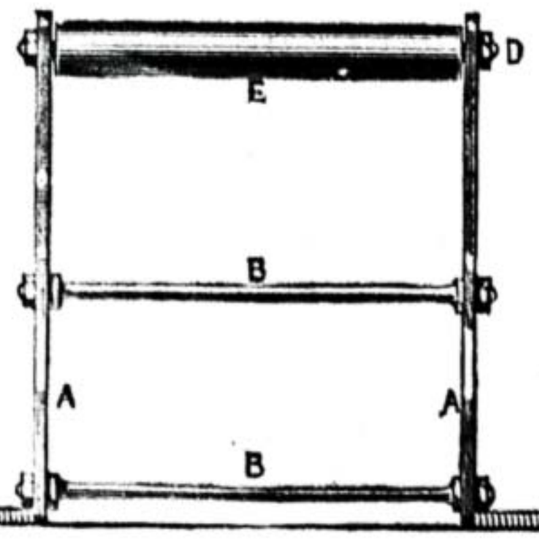
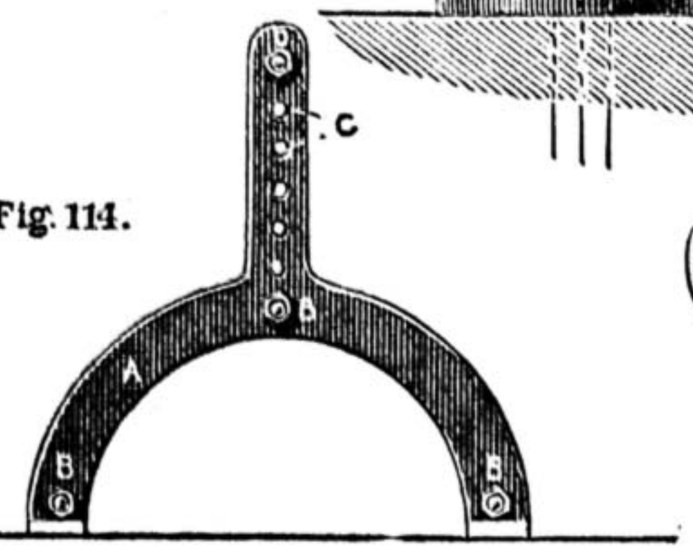


Fig. 114.



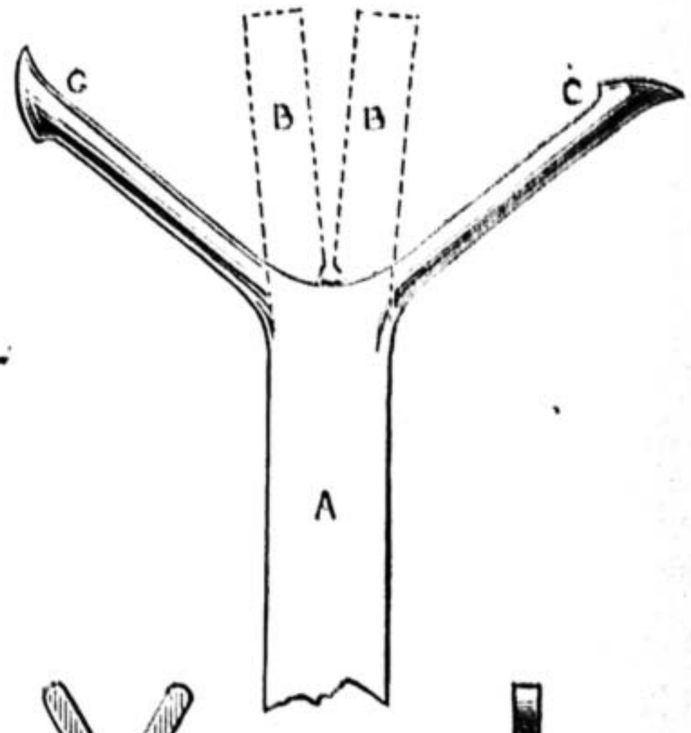


Fig. 120.

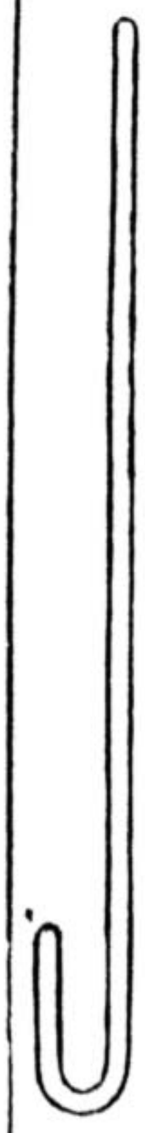
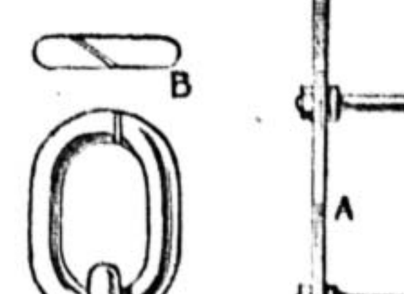


Fig. 116



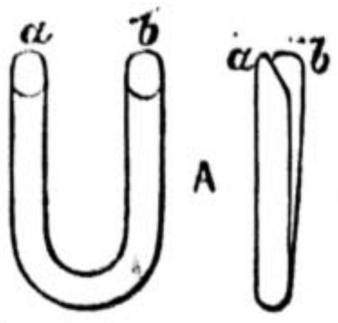


Fig. 118. (A.B.C).

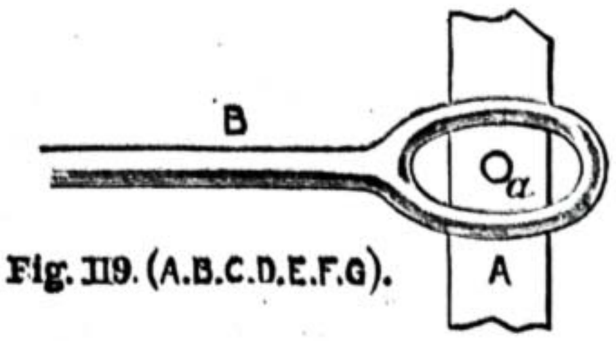
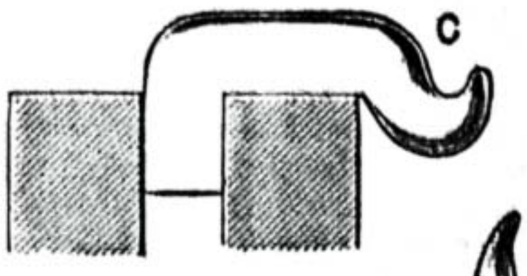
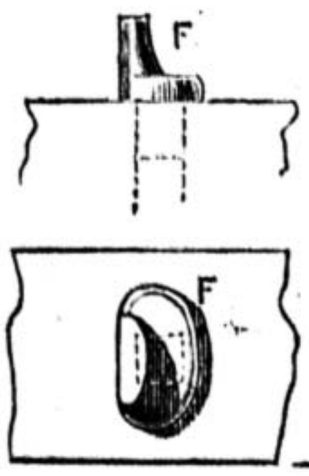


Fig. 119. (A.B.C.D.E.F.G).





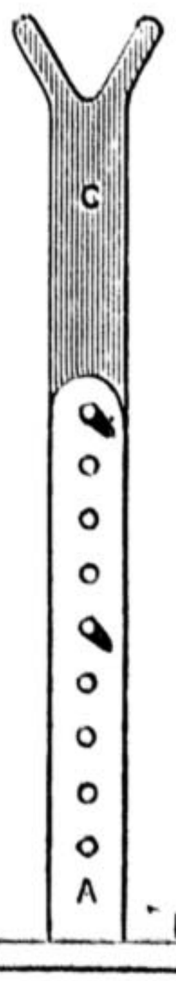
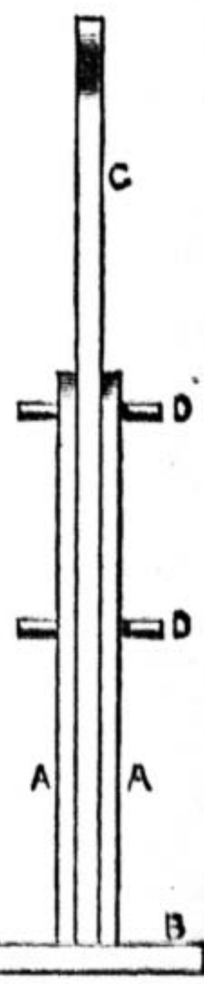


Fig. 115.



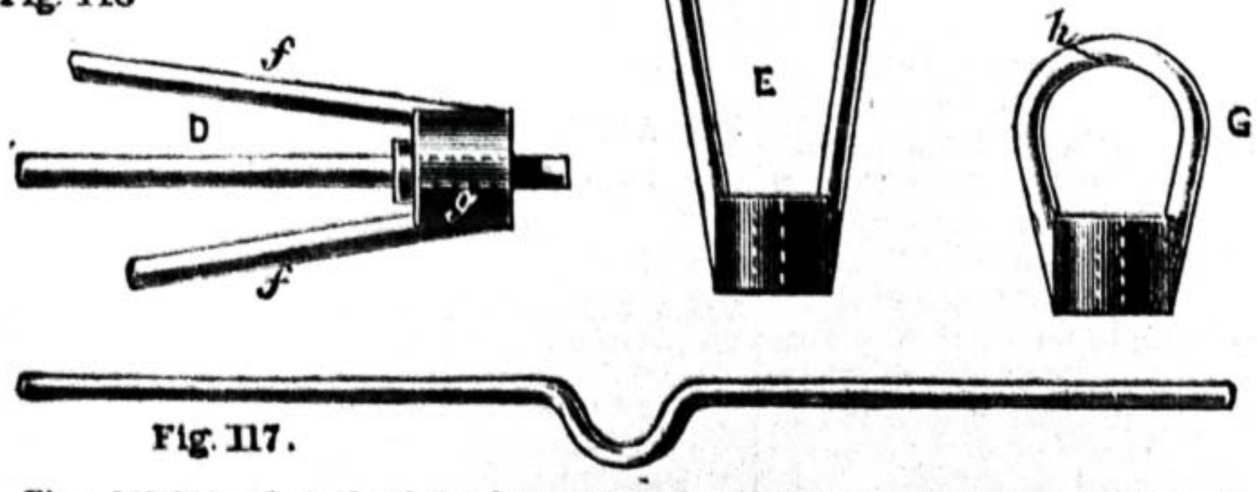


Fig. 117.

Figs. 103-110.—Details of the formation of Bolt Heads. Fig. 111.—Appliance for rounding Bolt Heads. Fig. 112.—Swage for Collar Bolts. Fig. 113.—Bottom Swage. Fig. 114.—Adjustable Support for Long Work. Fig. 115.—Another Form of Adjustable Support for Long Work. Fig. 116.—Carrier for Bars. Fig. 117.—Another Form of Carrier for Bars. Fig. 118.—Welding a Shutting Link. Fig. 119.—Details of the formation of Swivels. Fig. 120.—Alternative Method of forming Swivels.

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which a ring of metal is turned round and welded upon a bar whose diameter equals that of the bolt.

The details of the process are as follows:—

The heads are prepared as rings (Fig. 103) cut off from rectangular bar and turned round upon the anvil beak or upon a mandrel, but not welded as yet. For the shanks, suitable lengths of round rod are cut off. As many rings and lengths of rod are prepared as there are bolts wanted, to economise time, and then the welding begins. First, then, the end of a rod, made red hot, is driven vertically through its ring (Fig. 104); the ring lying upon the anvil, the rod is brought into a horizontal position, and the ring closed tightly upon it by two or three smart blows of the hammer, and also the end of the rod slightly burred over with the hammer (Fig. 105). This is done to keep the ring from slipping out of place. Then the whole of that end is put into the fire and raised to a welding heat, and sand sprinkled over it just before withdrawal from the fire. On being taken from the fire, the head is laid in a hexagonal bottom tool (Fig. 106), and about half a dozen blows given to it, altering the position of the head after each blow. These suffice to impart a pretty accurate hexagonal form to the head. It is then put into a bolt header (Fig. 108, A), resting on a tall heading block, B, of cast iron, pierced with a central hole, and the top of the bolt head, C, is well beaten over with hammer and flatter. The bolt is then put back in the hexagonal bottom tool (Fig. 107) and hammered once more on each separate face; then back in the bolt header (Fig. 108), and struck twice or thrice with a flatter, and then finished with a cup tool (Fig. 109), which gives the rounding at the edges. Finally, it is put back in the hexagon swage (Fig. 107), and a last blow given with the flatter on each face. All this is done at a single heat, and, when finished (Fig. 110), the bolt head, unless very small, is still at a good red heat.

In a well-appointed smithy, an appliance like that in Fig. 111 is employed for rounding off the heads of bolts; A is a bracket-like casting, bolted firmly to a heavy cast-iron base let into the ground. Through an overhanging boss at the top of A slides the shank of the rounding tool, B. This is plumb over a bolster, C, on the base. The bolt is dropped into the bolster, C, and the tool, B, struck upon it with a sledge hammer. The support, D, is merely for the purpose of supporting the rounding tool while not in use—that is, while the bolt is being slipped into the bolster. It is pivoted to a strap fastened to the side of A, and is turned to one side when the tool is being struck with the hammer.

Many bolts, such as those used for glands and for some forms of plummer blocks, are furnished with collars. These are usually welded on as rings, and finished in a die or swage of the form in Fig. 112.

A bottom swage like Fig. 113 is very useful, both for bolt making and for general work. Using this, a gradual reduction in diameter can be made without the trouble of changing the separate single bottom swages.

To make *nuts* in small quantities, take a flat rectangular bar of the same thickness and width as the nuts, and mark off and nick their lengths with a cold chisel. Centre-pop the centre of each space. Heat the bar and punch all the holes through in succession over a bolster. Then cut off each nut on the anvil chisel, and finish on a mandrel.

Long rods and bars, when being cut off or welded, require some support at the end farthest away from the smith; support is also wanted when two rods are being welded by a man working single-handed—one rod is held by the smith, but the other has to be supported by some mechanical contrivance. Any appliance of this kind should be provided with means of adjustment for varying height, to suit differences in the bulk or thickness of the work. One common contrivance of this kind is shown in Fig. 114; another in Fig. 115, and both, of course, are portable. In the first (Fig. 114), two cheeks, A, of wrought iron, cut to the outline shown in the end view, and maintained at a definite distance apart with the stay bolts, B, B, are pierced with numerous holes, C, at different heights. Into any of these holes the bolt, D, can be inserted, carrying the loose roller, E, that supports the work.

In the second (Fig. 115), two uprights, A, are tenoned and united into a foot, B. Between the uprights the forked piece, C, slides, and the insertion of pins, D, in any of the series of holes is the means by which the height of the fork, and, consequently, of the work, is regulated.

Sometimes the support consists simply of a forked end screwed into a socket, and turned up or down with the hand. But although the adjustment of such a form is more exact than the others, more time is necessarily occupied in effecting a considerable difference in the height.

Another method of supporting heavy work is by means of an endless sling chain dependent from a loose pulley, slung from a light jib overhead. The jib is like a crane jib, but it is not a crane, because there is no mechanical advantage gained, but only the convenience of bringing the sling chain within reach of the work, the extent of adjustment being only limited by the length of the pivoted jib that is free to swivel horizontally, and along which a roller runs, from which the endless sling chain and pulley depend. This contrivance is often used simply for lifting work of considerable bulk from the fire to the anvil, and *vice versâ*. For heavier work a pair of pulley blocks are often slung from a jib, and then there is mechanical gain, and facility for raising and lowering the work as well.

Bars which are too long for the tongs have to be carried about from the fire to the anvil, or to the steam hammer. Two forms of carriers are commonly employed. One (Fig. 116) is used underhand, being carried vertically with the hook lowermost, and the work, or one end of it, slung in the hook. The other (Fig. 117) is used for heavy forgings, being carried by two men. When one end of the work is carried thus, the other may be slung in the crane, or be merely supported or balanced with the tongs or other means.

The manufacture of chains is quite a speciality, but a smith is often called to mend a broken chain. When a broken link is replaced it is usually made a trifle longer than the normal link, for convenience of formation. Also when a link is added to one end of a chain for the purpose of connecting it to any attachment—as a crane hook, for example—the link is made slightly longer. Such an added link is termed a shutting link.

To weld a shutting link, the iron rod is first bent to a U shape (Fig. 118, A), then two opposite faces, *a*, *b*, are drawn off diagonally with the hammer, and the link is bent round to bring these faces nearly close together (B). The link is then put back into the fire, and brought to a welding heat, a little sand strewn upon it, and closed smartly with the hammer, first on the flat upon the anvil, and then upon a tool, C, fixed in the hole in the anvil. To smooth and finish the link a hollow swage tool is worked around it.

Swivels are of common occurrence, and require some art in making. The usual method of making a swivel is shown in the group of figures 119. A is a piece of rectangular bar of the most suitable dimensions available. Properly, its cross section should be rather greater than that of the boss of the swivel, because then no welding on nor upsetting will be necessary. A hole is first punched at *a*, corresponding with the eye of the swivel; then a moulding tool, B, of a type kept in various sizes in the shops, is laid across the red-hot bar, roughly concentric with the punched hole, *a*, and struck a few blows with the steam hammer, leaving the impressions *b*, *b*.

In the absence of a steam hammer, a fullering tool would answer the same purpose as B, but a rather longer time would necessarily be occupied. The tool B not only fullers, but also imparts the desired curved form to the incipient boss simultaneously. After fullering, the bar A is cut off at *c*, and the portions *d*, *d*, are drawn down to a sectional area a trifle larger than that of the arched portions of the swivel. At the same time the boss portion is shaped out of the lump *e* until the forging has the appearance of C. Then a mandrel, D, is passed through the punched hole, *a*, and the drawn down ends are hammered over as at *f*, *f*. At the same time the forging, while on the mandrel, is finished all over, except just where the weld is to be made, the boss *g* and the arms *f*, *f*, with their merging curves, all being gone over in detail with the hollow tools and fullers. The extreme ends of the arms *f*, *f*, are also scarfed and slightly upset, and the forging then has the appearance of E. The next operation is welding. To afford support to the swivel during this process, the beak of the anvil is utilised, or, better still, a special bolster-like tool, F, fitting into the hole in the anvil. The face of this tool is curved roughly to the curve of the swivel, and the work of welding and finishing with hollow tools is readily accomplished upon it, during which period the position of the swivel on its bolster is being continually shifted. The form of the finished swivel is shown at G, and the scarfed weld is at *h*.

Another way of forming such a swivel is shown in Fig. 120. A round rod, A, is divided and forked, as seen by the dotted lines, B, the divided ends still further opened out and drawn down and upset, as at C, C; after which, the process is similar to that shown in the previous group of figures.

AN ARMCHAIR: HOW TO MAKE THE FRAME AND UPHOLSTER IT.

BY DAVID ADAMSON.

FIRST STUFFING—STRINGINGS—SCRIM COVERING—STITCHING—TACK STITCHING—BLIND STITCHING—TOP STITCHING—SECOND STUFFING—COMPLETION OF SEAT—STUFFING BACK—ARM PADS.

WHEN the canvas or Hessian has been laid on the webs, as described in my last, the foundation is ready for the stuffing to be laid on it. Perhaps I should say that there are two separate stuffings in a properly upholstered

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chair seat of this description. They are known simply as first and second stuffings, from the order in which they are done. Naturally it is this first stuffing which we are taking now, and on the way it is done a good deal of the success of the seat depends. For the novice it is perhaps the most difficult part of the work, and it need hardly be said that if he can get some friendly upholsterer to show him how to proceed, or, at any rate, to look over the work as it progresses, it will be a decided advantage, though I will try to make every part of it as clear as possible, and those who follow the directions closely will have no excuse for going very far wrong. Still, there are little points which one cannot very well describe without running some risk of being misunderstood: or rather, there are details which evade description. For instance, it is almost impossible by mere explanation to convey a notion of the relative hardness or softness of the seat, whereas an experienced upholsterer could tell at once whether it had been too tightly or too softly stuffed, so that I advise all who are in a position to do so to submit their work to competent criticism. It is scarcely likely that the novice will make his first stuffing too hard; but it must not be inferred from this that it is to be as hard as a stone, but, on the other hand, it must certainly not be loose and puffy like a feather pillow. Neither extreme is desirable, but it may be said that a hard seat will keep its shape longer than a loosely filled one, and that the edges should be made as hard and firm as they can be. With the remark that the first stuffing may be regarded mainly as a foundation for the second, we may proceed to see how it is arranged. I may perhaps say here that seats are often upholstered with two qualities of stuffing material, the commoner one being used for the first, and the superior for the second. Thus hair may be used for the latter, flock or alva for the former. Seats so upholstered are said to be stuffed "part hair," it being understood that this material forms the second stuffing.

The first thing will be to fasten strings along the top of each rail. These pieces of string, or "the stringings," as they are called, are merely what may be termed loops for the hair to be tucked under, and held to some extent in place. It does not matter exactly how they are fixed and arranged, but perhaps the following description will show exactly what is needed. Drive a tack partly in on top of the frame, near one of the legs. Fasten one end of a piece of twine to the tack, and drive home. On the same rail, at a distance of, say, 6 in., insert another tack, and before hammering it down twist the twine round it. The stringing between the two must be left loose, and a fair enough guide for the degree of slackness may be got by inserting a couple of fingers between the twine and the wood. Go all round the frame in the same way, then fix stringings diagonally from corner to corner. These will probably be enough, but if desired, one or two may be fastened straight across. The stringings are now completed, and the hair or other stuffing may be worked in. Before putting any of it on the chair, see that it is well loosened and free from lumpiness. Distribute it evenly over the canvas, working it under the stringing; and here a difficulty about knowing when there is enough will probably occur. At this stage of the chair the appearance of the stuffing is apt to delude the novice, and I do not know that I can do better than recommend him to use his own judgment. The first stuffing, when completed, should be, for such a chair, about 2½ in. thick, and the loose hair must be added till it is considered there is enough to form this when pressed down. The great thing, however, is to get the stuffing even, so that the seat shall be equally hard all over.

When this has been satisfactorily managed, a covering of scrim must be put on. This must be cut large, so that it will come quite over the stuffing. It is to be fastened down temporarily to the frame with a few tacks, and then tied down. To effect this, the long upholsterer's needle is run right through the seat to form a few stitches or ties, which should be drawn moderately tight and fastened. The stuffing will thus be to a certain extent compressed, and the scrim may now be permanently tacked down to the outer edges of the top of the frame, which, I have omitted to say, should be slightly bevelled off for the purpose of allowing the tacks to be driven into them conveniently. Before fastening the scrim down, trim it off so as not to leave too great a quantity to be turned in. While the scrim is being fastened, work a little more hair in underneath it at the edges, and supposing the tacks are about 1 in. apart, leave the heads of alternate ones projecting a little: *i.e.*, do not drive them quite home. Each tack may be left in this way if preferred, but it is hardly necessary, as every other one will do perfectly well. As will be seen directly, twine will have to be passed under the tack heads, so that the amount to which they must project is not of great importance.

The corners of the scrim must be cut through diagonally, to afford space for the legs, and the superfluous material tucked down. The flat end of the regulator is for such purposes, but almost anything else, such as the flat end of a spoon or a knife-blade, will do very well. At this stage the edges of the stuffing will be loose and baggy. They must be stiffened and made almost straight. The way this is managed is by stitching them up.

To do this part of the work thoroughly well, at least three rows of stitching will be required, the long needle and twine being used. The first stitch, or rather row of stitching, will be what is called the tack stitch, from the fact that the twine passes under the tack heads. Its object is to draw or keep the stuffing well up to the edge. Making a start at the tack nearest one of the legs, the needle is pushed through in a slanting direction, so that it comes through the top three or four inches from the edge. The needle is pulled almost through and then pushed backwards, so that the eye end emerges just above the rail near the next projecting tack-head, and as close to it as possible. The needle is then withdrawn and pushed upwards again close on the other side of the tack, and the operation repeated till the work is done all round the chair. The tacks are then driven home, and, of course, hold the twine securely under them. It will be seen that this stitching is a series of loops within which the stuffing is caught, and in making them the twine should be drawn fairly tight and evenly. The scrim on top must not be included in the stitch, for which reason the needle is not withdrawn on coming through it, it being much quicker just to push it backwards than to draw it out, and re-insert the point without catching any threads of the scrim. When this stitch is made, therefore, beyond being indicated by the slightly altered form of the stuffing, it is not visible on top, and if neatly done, hardly more so by the tacks. While the stitching proceeds the regulator must be freely used to work the hair, and distribute it evenly if it should seem in excess in any place. The regulator is pushed through the scrim, and the stuffing moved about until it seems properly equalised.

The next row is known as blind stitching, but unless a really good firm edge is wanted, it is not always made, but when the edge of the chair is deep enough it is hardly advisable for the novice to omit it. In moderation, of course, the wider the border the more rows of stitching the better. The blind stitch is very similar to the one already described, the object of the two being identical. On the edges it will be a little above the tack stitch, and also a little nearer them on top. As the twine cannot be brought under the tack heads, it is visible on the edges, coming through and catching the scrim, but on top it is precisely like the other. The course of the needle is, however, somewhat different, as, instead of it being always forward or progressive, in order to catch the scrim at the side it must be pushed backwards. The accompanying diagram, however, will make this more explicit than words alone. The thick line represents the scrim on the edge, the course of the twine being indicated by the

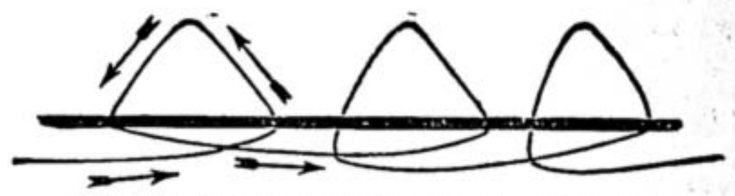

Diagram illustrative of Blind Stitch.

arrows. To keep the stitching regular, the twine is generally caught into a kind of loose knot on the edges. There can be no harm in doing so, but it is not always necessary. Those who wish to minimise the amount of labour expended on the chair may omit either the tack or the blind stitch. One alone will do, only the edge will probably not be so fine.

The next rows of stitching, of which there are two, are known as top stitches. In these the scrim is caught both on top and at the edges, so the twine is visible. They form the hard small roll which may be felt through the covering of almost any well-upholstered chair. The top stitches are very similar to the blind stitches—in fact, for all practical purposes it may be said that the difference is that the scrim is included on top as well as at the sides. They may be about 1½ in. from the edge, and should be pulled as tight as they well can be without distorting the seat unduly. As the object is to get a hard firm roll at the edges, the regulator must be used to work the hair well into them. The second row of top stitching is identical with the first, but is formed nearer the edge, which, when completed, should be perfectly firm and even. To make them so will not be altogether an easy matter at first, but the better they are the longer the seat will keep its shape.

The second stuffing comes next. It is comparatively simple, there being no stitched edges, the hair, which should certainly be preferred to any other material for this part of the stuffing, being merely laid on and covered over. Stringings, as before, will have to be laid. As the rails are now covered, they cannot be nailed

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down, but must be sewn through the scrim. A circular needle will be the most convenient for this purpose. A much smaller amount of material will be required for this stuffing than for the first, and great care must be taken that it may be evenly distributed; if not, inequalities will be even worse than if they had occurred before. Another matter to which attention may be directed is that the hair should not project over the edges, but be confined to the top. It should also be laid as flatly as possible, and not with an accumulation towards the middle of the seat. This will have quite enough rise without having an extra quantity of padding there, as it will be almost impossible to prevent the hair being a little thinner at the edges, or rather, being more compressed there by the coverings when the chair is new. A much rounded seat is not so desirable as apparently it is sometimes considered to be. A slight convexity of surface may look well in a new chair, because it is natural. An artificial heaping up is neither pleasant or necessary. However, to resume practical work, when the hair is distributed properly it must be covered with calico or any thin similar material. This must be tacked down temporarily to the frame. After sitting down on the chair for a few minutes, it will be very easy to judge whether the hair has been evenly and properly laid. If everything seems right, the calico may be permanently tacked down much in the same manner as the scrim. The tacks, being on the face of the rails, must be driven well home, that they may not be perceptible through the outer or finishing cover.

So far, only the stuffing of the seat has been referred to, but the work involved in the back is altogether simpler, as it much resembles the first stuffing without the stitching. Stringings must be laid as before, and only a thin padding of hair is required: much the same as that for the second stuffing. The calico is then tacked down over the edges, and to keep the hair from falling it should be tied, the stitches going right through and not drawn too tightly. It will readily be perceived that, with the exception of the outer covering, the upholstery is now finished. It seems to call for no special remark, beyond saying that care must be taken that it is neatly tacked down, so that the seat framing is quite covered. In connection with this, the novice's attention may be drawn to the necessity of not making the cuts at the corners by the legs too long. I suppose it is understood that a layer of wadding split open must intervene between the covering and the stuffing, both on the back and on the seat. The covering should be drawn tightly over, otherwise it will soon become baggy and have a slovenly look. When laying the wadding, see that it does not project over the edges. Naturally, to prevent mistakes, which it would be afterwards a difficult if not an impossible matter to rectify, the coverings will be first fastened down temporarily.

Nothing has been said about the arm pads as yet, though they should hardly be passed over without mention. They may be finished with a thin stuffing on top, similar to that of the back, or as shown in Fig. 1 (page 409), which certainly is the better of the two methods, and the only one which may possibly require a few remarks. It is done much in the same way as the first stuffing of the seat, the solid wood of course doing away with any necessity for web or canvas. A tack stitch and blind stitch—*i.e.*, a row of each—are advisable, after which the covering may be fastened down with a small piece of wadding on the top or flat part of the pad, so that it will be seen that they are treated very much as though they were diminutive seats without any second stuffing. The outside of the back also will have to be covered, which should be done before that in front is nailed down: unless, indeed, a separate piece is used for the borders of back, as it very well may be with a saddle-bag covering. In this case, after tacking the back and front coverings down on the edges it will be well to sew the bordering on. This should be done very neatly, and the seam or join may afterwards be hidden by stitching upholsterers' cord, or the ruche binding often used on easy chairs in combination with saddle-bags. There is, however, such infinite scope for taste in trimming upholstery, that beyond making these few suggestions, space cannot at present be devoted to this part of the subject, and the upholsterer who has succeeded in finishing the work otherwise will, no doubt, have his own ideas of what are, after all, only decorative details, and of secondary importance for anything except appearance.

Therefore, with a final wipe over by the polisher, we may consider the description of our great chair of ease as finished.

AN EASY METHOD OF RE-SOLING BOOTS.

BY C. E. MAES.

SELF-HELP being the object and aim of most amateur mechanics, a short space devoted to an easy method of re-soling boots as well as patching up worn soles so as to make them waterproof may not be amiss. A shoemaker perhaps would quote the old adage, "Nothing like leather," on finishing a perusal of the following remarks, and no doubt he would be correct if durability, lightness, and general convenience be taken into consideration; but, at the same time, we are rather apt to forget that leather, even if it be of the substance of which some of it is popularly supposed to be made, viz.: brown paper, is not the only material which may be used for boot and shoe soles. We have for example the unlovely but doubtless dry and durable clog sole of wood, by repute unsurpassed by anything for wife-kicking purposes in Lancashire and in other parts of the realm where the genial, mild-tempered, and altogether admirable labourer has notions of his own for promoting domestic bliss. Clearly our readers have no use for clog soles. Then we have india-rubber, but that is mostly used for goloshes. It, however, is very closely allied to the material which is suggested as a substitute, though possibly an inferior one, for leather—I mean gutta-percha. Now please, dear and thrifty reader, do not turn away in disgust and think you might as well use paper—I can assure you that gutta-percha makes by no means bad soles, and that with it you will find no great difficulty in either patching or entirely re-soling your boots. I do not recommend you to try it on your nice light boots; but if you have an old pair really not worth mending as you think, but which still—with a patch or two, that the cobbler can do, on the uppers, and soles only costing a trifle—can be made into good serviceable understandings for the country, experiment on them. Many an old pair of boots which are looked on as useless can be made thoroughly useful for winter wear, for it must be remembered that gutta-percha is waterproof. It is also light in weight, and, being a non-conductor of heat, is warm to the feet. It is, however, chiefly on the grounds of economy and the ease with which it can be used that gutta-percha is recommended here. I have prolonged the useful life of more than one pair of heavy winter boots with it. At the moment of writing I am wearing an old pair of sea boots the uppers of which have been patched wherever needed by the cobbler and the soles renewed by myself. They are not elegant, but after a long day out of doors on the wet Anglesey coast they are as dry inside as when they were put on. I have just been telling some of the people in the village where I am staying how I manage, and as what I explained was new to them, it may be equally so to many of the more extended circle of readers of this periodical. Hence my struggles with pen, ink, and paper.

The gutta-percha necessary (I do not think it is specially prepared for the purpose) can be got at any india-rubber shop. It is sold in pieces about ¼ in. thick, and of course as much as may be wanted must be bought. The measurement roughly can easily be got. Some cement will also be required; I find that used for fastening the india-rubber tyres on bicycles, etc., excellent for the purpose. I have used cuttings of gutta-percha instead, but do not find it so satisfactory, except perhaps to stick a patch on a worn piece of gutta-percha sole. In this case, though, a cement of any kind is hardly necessary, as the two surfaces being made sticky by heat, they adhere without further medium.

The soles to be repaired must be thoroughly dry before commencing operations. This is a *sine quâ non*; for if they be in the slightest degree damp, the new soles, though they may adhere for a time, will certainly come off ere long. That any dirt or clay must be cleaned off goes without saying. It may be advisable to tear off the bottom layer of leather, in which case a neater-looking job perhaps will result. I often, however, just take the boot as it is and lay the gutta-percha on. In either case the work is the same. It is well to warm the soles of the boots and put the cement on while they are so. The cement may either be melted in a ladle and poured on, spreading it thinly, or be used like sealing-wax by melting it as required and rubbing it on the boot, or bits may be put on the boot and melted and spread with a piece of hot iron—the kitchen poker, an old knife, or anything of the kind will do very well. I am by no means sure that this last method is not the best, as the hot iron seems to work the cement well into the leather, which, by the way, may often be roughened with advantage—any rasp, or even scoring and scratching with a knife will do. The cement should be evenly spread, and while it is hot is extremely tenacious. If it gets cold before the gutta-percha is ready to apply, it may be heated by the hot iron over a gas or lamp flame, or at the fire. The great thing is to bring the gutta-percha and the boots in contact while the cement is quite hot. The gutta-percha also should be hot, on the side of adherence hot enough to be soft and sticky. This can easily be managed by holding it close to the fire for a short time just before putting it on the boot. The gutta-percha should then be firmly but gently pressed to the boot. It will be flexible enough to yield to pressure

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and follow the curve of the sole if it has been sufficiently warmed.

When the new sole is firm and hard, as it will soon become if the boot is put in a cool place, the edges may be trimmed off. This can easily be done with a knife, as the gutta-percha can be easily cut. The cuttings should be kept, as they come in useful for repatching the sole as it becomes worn in places, so that there need be little, if any, waste. The final touches may be given by drawing a hot iron of any kind over the edges so as to smooth them down.

The sole as now made will wear a considerable time, though not so long as leather, but its wear-resisting qualities may be much increased by the use of Blakey's, or other boot protectors. These, as is no doubt well known to most readers, are pieces of iron, small in size, for fastening on to the sole in parts most susceptible to wear. They can easily be fixed. The caution that boots with gutta-percha soles should not be placed too near a fire may not be unnecessary, but beyond this no special precaution is necessary any more than in the case of leather.

A ROCKING-BOAT FOR CHILDREN.

BY "OUTIS."

THERE is at least one experience common to the skilled joiner and the amateur who owns a family, or is a member of one: neither of the two workers need be long "out of employment."

This truth was made very evident to me almost as soon as I had finished my "Child's Chair" (see page 103 of this Volume). From the chair to the boat was, I found—at any rate, in a child's imagination—little more than an easy step. It was useless pleading paucity of ideas, lack of wood, etc., etc. Evidently, according to the juvenile mind, ideas ought to crop up as readily and plentifully as daisies; and the amateur who once boasted of a boat made out of his own head was perfectly justified in adding that he had wood enough left to make another!

The only wood I could find left (in my workshop) to suit the idea that came into my head consisted of the fragments of some old packing-cases, and a few spars which once formed part of a greenhouse platform.

However, with a little care and arrangement, this somewhat unpromising-looking material served my purpose well enough—the rocking-boat made from it being strong and useful, and not at all unsightly. For over twelve months it has well stood the severe test of that rough usage generally accorded to children's playthings; and, beyond a few scratches, it looks little the worse for wear.

It will be noticed that the boat was designed to hold only two children. Of course, a similar one can easily be made to hold four inmates—by lengthening the rockers, and carrying the centre rib up through the floor, sufficiently high to form a support for two children sitting back to back. The older child sits on the raised seat, and swings the boat. The shallow box at the back of the lower seat is meant to hold a weight (in my boat there is a brick), to counterbalance any difference there may be between the weights of the children. The projecting arms, which form the sides of this box, also act as a safeguard against the boat being worked too high.

Detailed directions for making such a rocking-boat will scarcely be needed by anyone who carefully studies the illustrations here given, and knows how to use the most ordinary tools. Full dimensions are supplied, not necessarily to be exactly followed (for in some respects they were determined by circumstance rather than by choice), but as a guide to those amateurs who prefer to rely upon what has stood the test of actual experience.

It may, perhaps, be sufficient to mention that the seats and the floor of the boat I made were covered with old carpet, tacked down by small brass-headed nails, the other parts of the boat being painted to match the carpet.

A strap and buckle should be fixed to the sides of the lower seat, to prevent the child from sliding out, if too young to hold on by the sides. The sides of both seats should be securely fastened to the rockers with strong screws, as shown in sketch.

In addition, the arms of the high seat must be well screwed to the uprights, to which also the bars which form the back-rest should be tightly secured.

One word in conclusion. If, by making such a popular addition to the nursery as the rocking-boat is, and ever has been, any

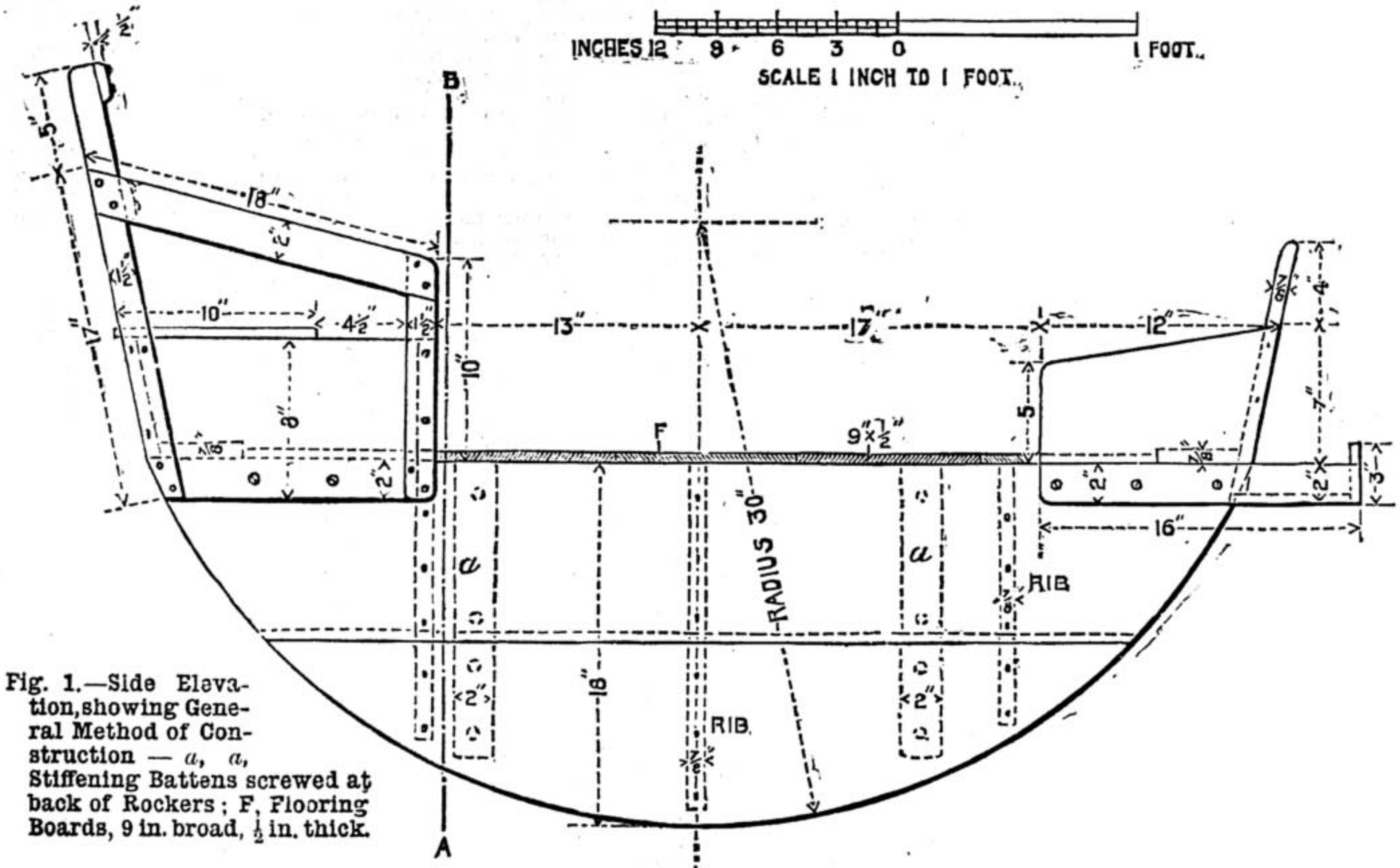

Fig. 1.—Side Elevation, showing General Method of Construction — *a*, *a*, Stiffening Battens screwed at back of Rockers; F, Flooring Boards, 9 in. broad, ½ in. thick.

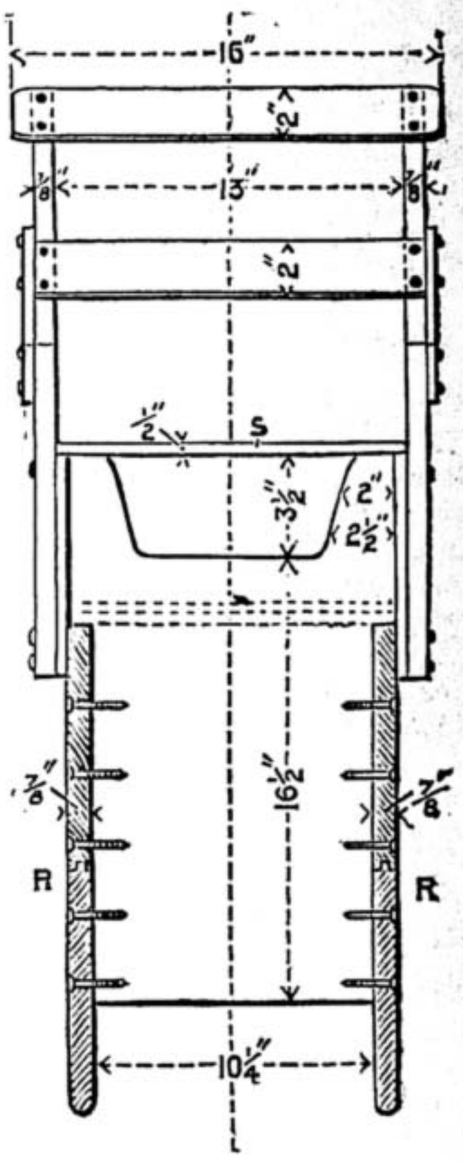

Fig. 3.—Sectional Elevation at A B, showing Rib carried up through Floor of Boat to form Foot Rest for Raised Seat—R, R, Rockers made of two 9 in. Boards, grooved and tongued together, ⅞ in. thick; S, Seat, ½ in. thick.

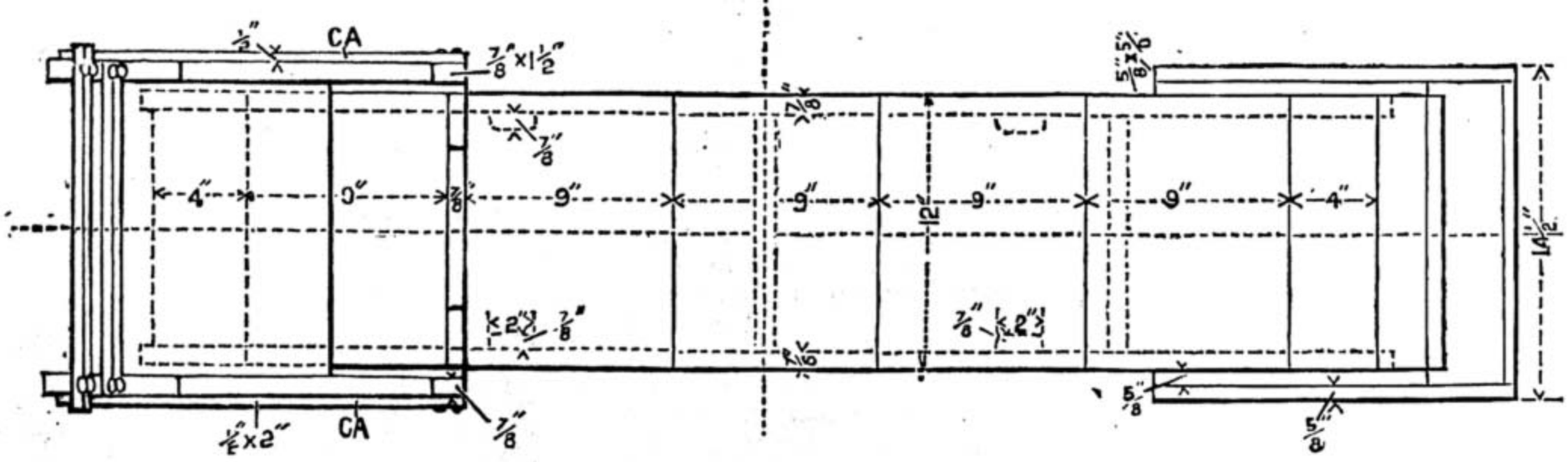

Fig. 2.—Plan, with Rockers, connecting Ribs and Battens, shown in dotted lines—CA, Chair Arm, ½ in. thick.

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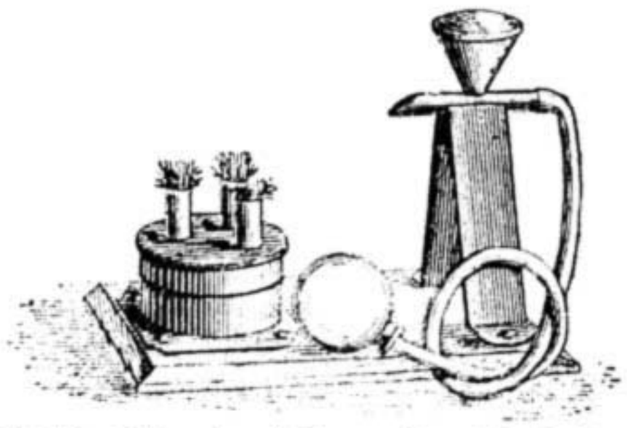
workman (be he professional or amateur) succeeds in diminishing the tears and increasing the smiles of those little mortals whose existence ought to be a source of joy and happiness to themselves and others, he will not lack a real and valuable reward. Certainly he will not find any of his "customers" more gratefully appreciative of his efforts to please, nor, it may be affirmed, more ready to supply him with "further orders."

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

126.—PLATT'S "SIMPLEX" REPEATING FLASH LAMP.

THIS is a lamp manufactured and sold by Mr. E. R. Platt, Birkbeck Works, Birkbeck Road, Ridley Road, Kingsland, London, N.E., at 3s., or 3s. 6d., post free. It is, as its name implies, intended for photographic purposes, and is sent out furnished complete with ball, tube, cotton, and sufficient magnesium powder for fifty exposures. The powder for this number of exposures is stored in the funnel shown in the accompanying illustration. It is claimed that



Platt's "Simplex" Repeating Flash Lamp.

the simple contrivance of this lamp at once shows its superiority and advantages above all others by reason of its containing no complicated parts to turn, and that it can be used at any time by the storage of magnesium powder in the funnel, which renders its use economical as well, other lamps using a funnel-full for a single discharge. On testing the lamp, it proves to be a good workable lamp—indeed, very good, considering the price asked for it; but there seems to be nothing particularly novel about it. It gives a good light with a small supply of magnesium, but possibly, if the spirit flame was rather more distant from the discharge, it might be an improvement. The quantity of magnesium sent with the lamp was exhausted after twenty-six exposures, so possibly it was not the regulation allowance for fifty. It should be said that T-pieces for blowing two or more lamps can be supplied, and that for 5s. a lamp can be had better in appearance than the ordinary lamp at 3s., being better finished and nickel-plated.

127.—LOCKWOOD'S BUILDERS' PRICE BOOK, 1891.

This is the edition for 1891 of Lockwood's "Builders', Architects', Contractors', and Engineers' Price Book," a work which, from its nature, and the copiousness of information on every subject on which it treats, is invaluable to those for whose use it is intended. It is described on the title-page as "A comprehensive handbook of the latest prices of every kind of material and labour in trades connected with building, including also a great variety of the most recent in formation in all matters concerning these trades." In the present edition special attention has been given to the important subject of electric lighting, and sanitary appliances in their newest forms, ventilation, and lighting generally are among the subjects that have been taken up and carefully dealt with in this volume. Moreover, prices for measured work have been calculated on the basis of present prices for labour and materials, and various legal notes and memoranda, specially useful to the builder and contractor, have been added to this edition. These legal notes, with the principal provisions of Acts of Parliament relating to building and sanitary matters, the rules and regulations issued by the London County Council, the Corporation of London, and other public bodies, and the headings for contracts drawn up by the Royal Institute of British Architects and the London Builders' Society, will be found in the appendix, a most valuable part of the work, replete with useful information, which is here brought together from many different sources and focussed, as it were, for the use and benefit of those who use the work. It has been re-written, considerably enlarged, and brought to its present form by the editor, Mr. Francis T. W. Miller, A.R.I.B.A., and is published by Messrs. Crosby Lockwood & Son, 7, Stationers' Hall Court, Ludgate Hill, London, E.C., at the low price of 4s., seeing that the book contains 616 pages of text and 58 pages of advertisements, which in themselves are guides to many a good thing required daily in the building trades.

128.—"FURNITURE AND DECORATION."

This is a useful monthly publication devoted to an exposition of every subject connected directly or indirectly with the internal decoration of our houses and public buildings and the furniture and fittings that are found in them. It is conducted by Messrs. Timms and Webb, and is published in monthly parts at 6d., and handsome yearly volumes, substantially bound in cloth, at 7s. 6d., by Messrs. Smith and Botwright, 6, Eldon Street, London, E.C. There is so much to look at in the various designs with which this attractive publication is profusely illustrated, that it is really a matter of considerable difficulty to make a selection for special praise. I may, however, call attention to an article entitled "Simplicity in Furnishing" in the first number of the second volume—the number bearing date January, 1891—which not only conveys sound and acceptable teaching on true beauty of design, good workmanship, the absence of too elaborate ornamentation, and congruity in the furniture and general decoration of a room, but gives the front elevation, side elevation, and details of one of the handsomest, neatest, and most attractive sideboards it has yet fallen to my lot to see on paper, and which I trust one day to see reproduced in wood for my own use. It is professedly on "simple Chippendale lines." The bottom board of the carcass is placed on a base, supported at the corners by slightly curved legs, each terminating in a foot projecting outwards from the sides. Thus there is a space 9 in. or 10 in. in height under the sideboard, always desirable for cleanliness' sake. Between the bottom and top boards of the carcass are two cupboards with a revolving cellarette between them, and three drawers, which are separated from the cupboards and cellarette below by a small moulding enriched with dentils, the only attempt at ornament throughout the whole structure. From the broad shelf, at the hinder part, rise boldly formed brackets, supporting a narrow shelf, from the rear of which rise, above the brackets, four *quasi* pilasters, these, and the plain woodwork between, forming a back to the smaller shelf. The pilasters form supports for four brass standards, about 18 in. in height, carrying horizontal brass rods, which, in their turn, support hangings, which impart lightness of appearance and character to the whole, and which may be varied both in material and colour, partly in accordance with the season of the year, and partly in reference to the prevailing tints of the wall behind and the drapery and upholstery of the rest of the furniture of the room. It would be difficult, I think, to produce a sideboard that would equal this in point of simplicity and tastefulness. THE EDITOR.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

I.—LETTERS FROM CORRESPONDENTS.

Erratum.—T. R. B. (*Blaydon-on-Tyne*) writes:—"In the first column, page 717, Vol. II. of WORK, the words 'Along the steam-port *fence*,' should read 'Along the steam-port face.'"

Violin Bridges.—COMME IL FAUT writes:—"Occasionally, one or two strings on a violin are simply splendid in tone, others tubby and the G tinny. Has the bridge anything to do in the matter? Undoubtedly! Take, for instance, the old style of bridge, Fig. 1; by varying the distance from the top to the cut-out portions, and also by the thickness of the bridge itself, the tone can be altered; but this alone does not always effect the desired result. Look at Fig. 2, and read the following quotation:—'The old form of bridge was never adapted to the requirements of the instrument; it had not been studied as a mechanical medium for the just intonation of one string with the other. For instance, the second and third string come over the broad and least resisting part of the bridge; consequently, there being no yielding medium to set up the vibrations in the belly, we experience the harsh tubby tone so frequent in these strings. Now, it will be seen the new bridge represents a lever, the first string standing over its fulcrum, it being the string with the shortest and quickest vibrations, the second, third, and fourth setting up slower vibrations successively, according to the position of leverage on the bridge.—OASIS.' Now, I have constructed several of the 'Oasis' bridge as described above, with a marked improvement in the tone,

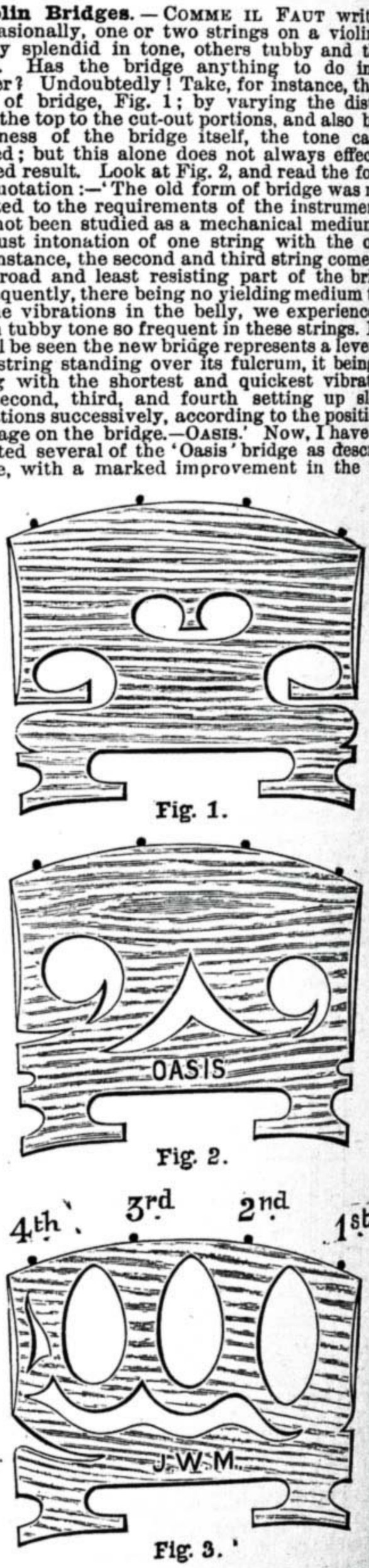


Fig. 1.

Fig. 2.

Fig. 3.

Violin Bridges.

especially of the first string, but failed in getting equalised results for the four strings. I, after experimenting with endless forms, at last made a bridge of the form shown at Fig. 3, thus altering the vibrations of the bridge in a most marked manner, the vibrations of each string *principally* affecting the part of the bridge beneath it, thus *in a measure* providing a bridge for each string, the *grain* of the wood to run slightly inclined downwards towards the first string. By altering the length and breadth of the cut-out parts, thus leaving more or less wood beneath each string, the tone of each string can be varied without affecting

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the others; the bridge should be a trifle thicker than ordinary, and not tapered to be so thin at the top, but left so when rounded gradually off, to be about ⅛ in. where strings rest on top. Take care that the strings are strung to *exactly* the same pitch when testing different bridges."

Cheap Stair-Eyes.—H. J. L. J. M. (*Ealing, W.*) writes:—"Stair-eyes can be made at home very easily by cutting stout brass wire (12 or 13 B.W.G., or even stouter) into lengths, flattening out the ends, and drilling or punching small holes in the flattened portion. These pieces of wire can be fixed to the stairs by the ordinary escutcheon pins. The simplest way to fix them is to cut a gauge of wood, triangular in shape, to represent the space to be occupied by the rod. By putting the gauge into the angle of the head, a support is made for the wire eye while nailing and pinning it in position. As an alternative, the eyes may be cut out of sheet brass, using the thickest metal that can be cut with an ordinary pair of hand snips. The required number of eyes may be marked out on a sheet of brass, and the holes drilled before cutting up the brass into strips. The strips can be as easily beaten into the shape required as the wire eyes mentioned above."

Steamy Windows.—H. J. L. J. M. (*Ealing, W.*) writes:—"In these cold days, when so many shop windows look like waterfalls from the condensed vapours that course down them, a means of stopping it may be welcome to some. I saw the plan at work in a ham and beef shop window at Bournemouth, and give it for what it is worth. Along the front pane of each bay-window of the double-fronted shop there was fixed a length of brass ½ in. pipe, with a gas jet every 4 or 5 in. These jets, which were placed as close to the plate glass as possible, consistent with safety to the glass, were lighted, and were kept burning all day, with the result that the window was perfectly free from steam. The gas seemed turned on only to about half its full extent, and I imagine the gas jets were burners of small size, as otherwise the expense would be enormous."

Useful Mallet.—H. J. L. J. M. writes:—"A very useful hammer or mallet can be made of a piece of tubing filled with lead or compo metal, to give it weight and solidity. I have a small one which I made of a piece of brass curtain-pole (which consists of thin iron tubing cased with still thinner brass), about 2 in. long, and 1 in. in diameter. I filled it with capsules and bottle-tops melted down, so as not to make it too heavy. It is very useful for knocking together any pieces of work that would be likely to be damaged by an ordinary hammer, even of half its weight. A tap from this lead hammer will drive home a pronged chuck into the mandrel nose with ease; whereas a blow from a hammer would damage the centre-point of the chuck. The mallet is useful too in *repoussé* work in knocking up large surfaces where a heavier hammer than usual is required."

Chilblains.—H. J. L. J. M. (*Ealing*) writes:—"Medical subjects do not come within the province of WORK, but as I can give the following as a 'means' of curing the unpleasantness known as chilblains, it may be acceptable, especially as chilblains can be bad enough to keep their 'victims' temporarily out of work. The remedy is 10 grains of sulphate of copper and 1 oz. of hot water. Let the sulphate of copper dissolve in the hot water; then dabble the chilblain with the solution, and when dry anoint the part affected with grease or oil of some sort. Vaseline, cold cream, or spermaceti ointment all do equally well; a speedy cure is the result, as I can testify. This remedy is *not* to be applied to broken chilblains."

Browning Gun Barrels.—E. H. H. (*Chatham*) writes:—"The following is the recipe used by the military for browning gun barrels:—Acid, nitric, 1½ oz.; nitre, sweet spirits of, 3 oz.; steel, tincture of, 3½ oz.; vitriol, blue, ½ oz.; wine, spirits of, 2 oz.; water, spring, 12 oz. It would be the wisest plan to take the gun to a gunsmith. The above is sufficient to do fifty guns."

Oak Chair.—E. P. W. (*Warrington*) writes:—"I will try to describe this home-made chair as briefly as I can. The cushions are loose, so that I can take them off, and give the chair a rub with linseed oil when I like. It is 1 ft. 6½ in. wide in front inside the legs. You will see by Fig. 2 that the back frame and seat are hinged together; two brass plates are let into the runners under the seat 7 in. long (see Fig. 8), with holes drilled about ¾ in. apart; two studs are let into the under side of seat so that they will drop into the holes in the brass plate (see Figs. 9 and 10) two brass plates are screwed into the inside of back legs with a slot 5 in. long (see Fig. 12). Cut a groove in the wood to allow the head of screw (Fig. 11) to slide in. This has a square head; I got these screws at a gunsmith's shop. They are screwed into the stile of the back, and the plate (Fig. 12) into the leg. It will work like a pivot, so that by raising the front of seat about 1 in., you can draw the seat forwards; drop it into any hole you like, and the back falls back at the same time; the seat is the same width back as front. The reeds were done with a scratch. You will see that I have got some of my ideas from the 'Old Oak Bureau' and the 'Three Prize Bookcases,' which appeared in WORK."

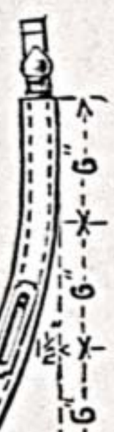
Fig. 1.

Fig. 2.

Fig. 5.

Fig 6.

Fig. 7.



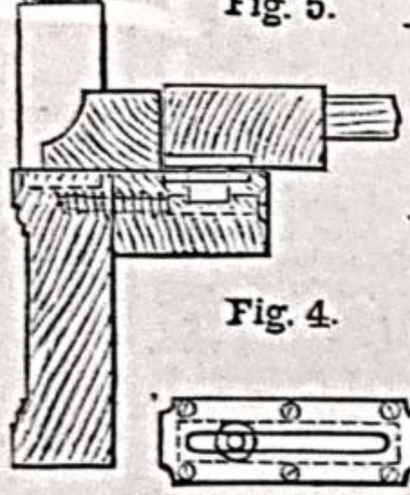


Fig. 4.

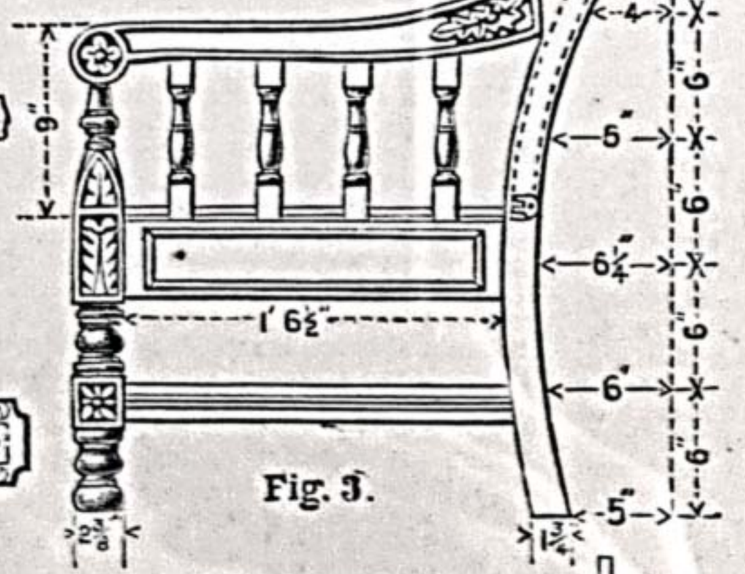


Fig. 3.

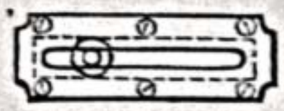


Fig. 12.

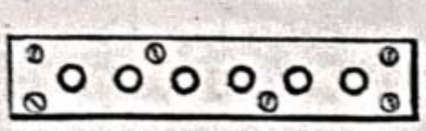


Fig. 8.

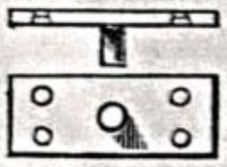


Fig 10.

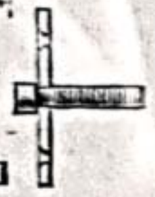


Fig. 11

Fig. 1.—View of the Chair with the Back upright. Fig. 2.—Seat drawn forward and Back reclining; Cushions taken off to show Framing. Fig. 3.—Side Elevation. Fig. 4.—Cross Section, showing Line of Leg and Rail and Turned Spindle Scotia scribed to the Spindle, and to be flush with Inside of Leg Runner, Rack, and Seat. Fig. 5.—Turned Knob and Reed Back Leg. Fig. 6.—Top of Stile on Back Framing, showing how the Reed is finished, and Section. Fig. 7.—Section of Arm. Figs. 8, 9, 10, 11, 12.—Not drawn to scale.

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Seal Gas Engine.—DEPTFORD.—Apply to J. Seal, 67, Carthew Road, Hammersmith, W., as to the above gas engine.

Carvers' Tools.—J. D. (*Tiverton*).—You can get these from J. Buck, 36, Holborn Viaduct; R. Melhuish & Sons, Fetter Lane, London; or J. H. Skinner, East Dereham.—M.

WORK Exhibition Number.—ERRATUM.—In page 21 of this special number, the inscription to the cut of swimming propeller inserted therein should read, "Gay's Swimming Propeller," instead of "Cowan's Swimming Propeller," as the illustration in question shows; the swimming-plates and shoes invented by Mr. Gay of Northfleet, and not the propeller invented by Mr. Cowan of Glasgow, which consists of three small plates fastened to the leg just above the ankle, there being one plate on each side of the leg, and a third behind.—ED.

Treadle Fret Saw.—S. C. (*Ashton-under-Lyne*).—Your letter should be addressed to the advertiser you refer to. There is nothing to indicate who this is.

Chimney.—W. C. M. (*Sunderland*).—I am quite aware of the trouble in sweeping chimney pot, Fig. 1 (see page 683, Vol. II.), and I do not admire the unsightly appearance, but the two shown were the most suitable pots made in fire-clay for the case submitted to me, and if you refer to page 683 you will see I recommended Fig. 2, although in this district there are many used similar to Fig. 1; and those that have come under my notice do not require any extra sweeping. In your case, if the chimney is raised above the houses at the west side, it will most likely cure it; but if it requires raising to a great height, it is not advisable to do it, as there is a danger of its being blown down in a gale. There is a patent chimney cowl manufactured by Boyle and Sons, Holborn Viaduct, which they recommend for preventing down draught.—M.

Spring Mattress.—HOPEFUL.—As you want to make the mattress in two parts, let me first say that they should not be of equal size, or the division between the two will be too plainly felt. Make one of them about double the size of the other, or, in other words, the smaller piece should be one-third of the entire length of the bedstead, and should be placed at its foot end. The division is of course to be across the bed and not from head to foot. If you can manage to have the mattress all in one piece it will be all the better, as there are objections to a divided mattress. This latter is, however, more convenient in case of removal, especially if the bedstead is a wide one. You do not say what width you want to make the mattress, so I can only say generally that unless it is a wide one, it will not be worth while to go to the trouble of making it in two parts. First of all, you must make the frame or box—or two of them if the mattress is divided—of 1 in. pine, the width of the stuff being, say, 5 in. to 6 in. Dovetail the corners, or, if preferred, nail them and strengthen inside with blocks glued into the angles. These frames now resemble the sides and ends of a box to which there is neither bottom nor top. By way of bottom, some pieces of pine, about 3 in. wide by 1 in. thick, are now to be fastened across from side to side at a distance of 5 in. or 6 in. apart. They should be let into the edges of the sides so that they lie flush with them, and not merely laid on them. They may be dovetailed, but it will serve every purpose to simply cut spaces in the sides and to fasten with screws. A high degree of finish is not at all necessary, as the woodwork is covered in afterwards. Strength and solidity are the great points to be attended to. On to these bottom laths the springs are to be fastened, as they easily may be, with ordinary wire staples such as can be obtained at most ironmongers'. Three of them will be enough to fasten down each spring with. The springs are of the kind used by upholsterers in chair seats, etc., but they must not be too small nor too weak. As they are made in many sizes and gauges, a suitable spring for you to order will be the 10 in. No. 7 gauge. Reckon a spring for about each 9 in. to ascertain the number of springs required. Fix them at equal distances apart from each other, so that they form straight lines from end to end and from side to side. Now lash them each way with twine, the ends of which are to be fastened to the framing. Where the cords touch in crossing, tie them to prevent wear, and on the whole act as if you were doing a spring-stuffed seat. A covering of canvas (Hessian) is now to be fastened on by tacking round the upper edges of the frame. As the springs will stand higher towards the centre of the mattress than at the edges, a stuffed roll will have to be formed along these. Make it by sewing the edge of a strip of Hessian 14 in. to 15 in. wide, 5 in. to 6 in. from the framing to the covering. Stuff hair under, and tack other edges of strips to frame. Use three rows of stitches, viz., one row top and two rows blind, to firm the roll. When this has been done, proceed to lay the rest of the stuffing all over, tying down at intervals to prevent shifting; cover over with Hessian pulled firmly down. Finally cover over top and wood with ordinary bed ticking, plain or welted according to fancy, and finish off by tufting. For quantity of stuffing required, reckon about 10 lbs. per foot of width if hair or fibre, and other materials accordingly.—D. A.

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Zinc Manufacturers.—M. E. (*Birkenhead*).—The following addresses may be useful to you:—Frederick Braby & Sons, Euston Road, London; Croggon & Co., Upper Thames Street, London, E.C. You can get all you require in zinc of these firms as cheap as of anyone. Enclose trade card for trade prices and discounts. It is useless for querists to ask for replies in the next issue, as that would be an impossibility, owing to the pressure on "Shop," and to the fact that in consequence of its large circulation, the paper goes to press a fortnight before it appears.—R. A.

Electric Bells.—LEWIS.—In planning an electric bell system for a house, sketch out each bell circuit on paper and complete it before going on to the others. For instance, beginning with the front door, sketch out the battery, lead one wire from one end of the battery to the front door push, then lead a wire from the push to one terminal of the bell, then lead a wire from the other terminal of the bell back to the other end of the battery. This will complete one circuit. Sketch out all other circuits (each separate push having a separate circuit) until the system is complete. Then use ink of another colour and economise wires where it can be done without interfering with the general working of the system. This done on paper, carry out the ideas in practice. Any alterations to be hereafter made must proceed on the same principle. For instance, taking your own bells (two bells mounted on one base-board): the wire B in the centre of the board connects both bells with the battery; the wire A connects one of the bells with one of the pushers, and the wire C connects the other bell to another push. From each of these pushers a wire goes to the battery, either direct, or as a branch connected to a main wire traversing the whole round of pushes. Only a personal examination of the wires is needed to determine how they run, as you say they are coated in different colours. If you wish to shift the bells, you must alter the wires to suit the new position. Both bells will ring if you connect the middle stud to one end of the battery, and the two other studs to the other end of the battery. Both will ring at the same time if the battery cells are large enough to generate sufficient current. If you cannot now clearly understand how to fix your bells, please ask again and give me full particulars. I shall always be pleased to help you.—G. E. B.

Griscom Motor.—W. D. (*Leeds*).—(1) In the dimensions on p. 92, Vol. II., read 3 in. instead of 6 in., as the diameter of the fields of a Griscom motor. (2) If the F.M.'s are to be connected up in shunt with the brushes, use 1 lb. of No. 24 on the fields. (3) Armature solid for such a small machine. (4) The pole-pieces should fit within $\frac{1}{32}$ of an inch of the armature, but the wired parts must not come so close.—G. E. B.

Lens.—C. H. W. (*Hampstead*).—All lenses mentioned in the articles on "Compound Kaleidoscope" may be obtained from Messrs. J. Lancaster & Son, Opticians, Colmore Row, Birmingham. The reason why the instrument is so constructed as to be capable of rotation on its axis, is so that it may afford variety to the patterns presented to the view when the objective shown in Fig. 12, p. 808, Vol. I., occupies the place of the object-box, when objects in nature or works of art, at a distance or close at hand, are so focussed by means of the lens as to appear within the ends of the reflectors, which are adjusted so that a perfectly symmetrical pattern is produced, when a similar effect is obtained by rotating the instrument to that which results from turning the object-box, and giving rise to a greatly increased number and variety of figures not otherwise attainable. It is not imperative that the bottom edges of reflectors should meet in centre of object-box, but in the case of the eyepiece, it is important to observe that the small pin or screw inserted in the groove which forms a stop for the bayonet-joint of the eyepiece should be so placed that when the tongue abuts against it, the centre line of the slide should bisect the angle formed by the reflectors, so that in using the eyepiece the opening in the diaphragm should occupy the same relative position to the silvered face of each reflector, and be kept as near the angle as possible without exposing the ends of the reflectors to view.—T. R.

Brass Plates.—ENGRAVER.—Will ENGRAVER (*Glasgow*) kindly refer to No. 55, page 46, Vol. II. of WORK? and among the "Brief Acknowledgments" he will find his communication to the Editor duly recorded. I fear you must submit to the ordinary course for acquiring information through the columns of "Shop," and, as all correspondents are answered in their turn, it would be obviously unfair to answer any question except in its proper order. Please to exercise a little patience, as the Editor is doing all in his power to reduce the pressure of correspondence in "Shop" by periodical supplements, the first of which disposed of nearly one hundred questions, in addition to the usual weekly quantity. If it will be any consolation to you, I may inform you that you are not alone in your difficulty, and before this reaches your eye, the answers to your queries will perhaps have appeared.—N. M.

Fishing Rods.—TELESCOPIC.—TELESCOPIC writes:—"Will any of your readers favour me with the information how to make the ordinary fishing-rod ferrules? I have been using a broaching bit having twelve cutting edges; it is $\frac{1}{4}$ in. diameter, with a $\frac{1}{16}$ per in. taper; this 'seizes' when it has passed up the tube about $\frac{1}{2}$ in., and is very difficult to withdraw without damaging the ferrule. I have tried various lubricants without success." The difficulty does not lie in the lubricant, but in the broach. With twelve cutting edges it has no chance of clearance, and consequently it gets jammed. TELESCOPIC will find a five-sided broach much better than the one he is using. Then, again, does TELESCOPIC withdraw the broach frequently whilst boring? If this is done, I do not think there will be any difficulty experienced. TELESCOPIC further asks for the address of a firm who makes ferrules for fishing-rods, as he requires a large number of one size. Possibly this may catch the eye of some maker, and it might pay him to advertise his address. In the meanwhile, I would suggest that in Manchester, where TELESCOPIC resides, there must be multitudes of brass finishers and philosophical instrument makers who have facilities for making what he requires.—O. B.

Rods for Plate Rack.—J. N. (*Erith*).—There is no place, as far as I am aware, at which you could buy rods $\frac{1}{2}$ in. in diameter for a plate rack. Any carpenter will make some for you, but you will find it cheaper, if you can handle a saw and a plane, to make them for yourself. For rods $\frac{1}{2}$ in. in diameter get a piece of wood $\frac{5}{8}$ in. thick and cut it up into square rods, after spacing out your board accordingly. Then plane off the arris at each corner of the rod and work off the edges with the plane till the rods assume a rounded appearance. Then finish up with sand-paper. If you go to work carefully, and not plane the rods down too much, you will find $\frac{1}{2}$ in. stuff thick enough for your purpose.—ED.

Slide Valve.—G. E. A. (*Newport, Maindee*).—(1) I consider that if I extract the cube root to two places of decimals, that that is quite near enough for all practical purposes. If we have a slide valve set to $\frac{1}{100}$ part of an inch, that is surely near enough. (2) Please go over the extraction of the cube root of $\frac{3}{4}$ in. again; it is not ·908 in., nor is ·908 in. equal to $\frac{7}{8}$ in. (3) By taking an indicator diagram, we see at

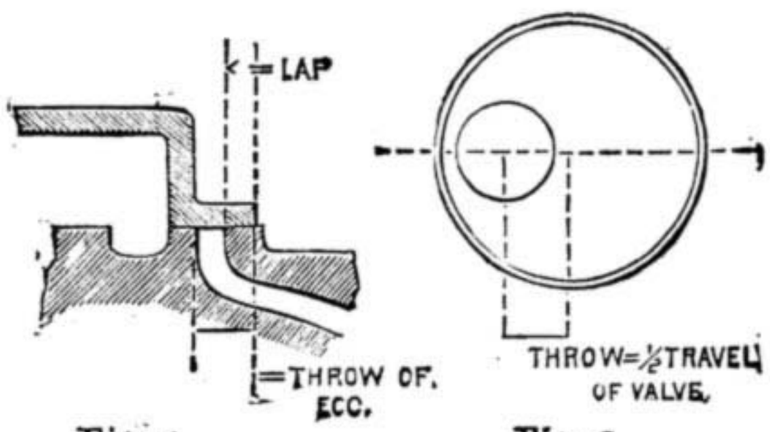

Fig. 1. Fig. 2.

Slide Valve.

once where we cut off; also, if the engine is working in a proper manner or not. (4) Fig. 1 represents common slide with "lap" shown on one of the steam ports; that distance and the width of the steam port is equal to the throw of the eccentric, as shown again in Fig. 2. It must be remembered that the "lead" of a valve has nothing whatever to do with its *travel*. "Lead" can only be got by moving the eccentric forward of the crank on the shaft. Of course, if the valve does not work direct from the eccentric, the difference in its travel will be in proportion to the system through which it works. (5) Double-ported valves are used when a shorter travel is wanted; the area of each port is the same and their combined area equal to the single-ported arrangement, which we have discarded for them. A good area of steam port (single) is area of cylinder in sq. in. ÷ 12. In a double-ported arrangement, the two ports would be equal to that in area. (6) The slide valve that you are puzzled about is called an expansion slide. They are of two kinds—"fixed" and "variable" expansion; and their position varies in proportion to the ratio of expansion they are to work at. In many cases the expansion eccentric is fixed nearly opposite the crank pin. Do not apologise for asking so many questions. I am only too happy to answer them where I can give instruction.—T. R. B.

Glasgow Exhibition.—G. T. (*Holborn, E.C.*).—All the information you seek would be most readily obtained were you to apply to the Glasgow City Authorities, Glasgow.

Angling.—AN ANGLER.—Papers on Fishing Rod Making will be given in Vol. III. of WORK, but there will not be any instructions, or "items," as you put it, on angling.—ED.

Binding WORK.—J. N. (*Erith*).—Cases for binding the volumes of WORK are supplied at 1s. 3d. each; or 1s. 6d., post free. You must get a binder to put your parts or numbers, as the case may be, in the cases.—ED.

Castings.—WESTWARD HO!—It is not cheap for a skilful man to cast his own brass at home. First as to melting. You can melt brass in a large kitchen grate, using coke for fuel, and confining the draught to the bottom bars by suspending sheet iron in front of the rest of the range. Or, better still, you can do as is frequently done: have a brick-lined sheet iron structure measuring, say, from ten to fifteen inches inside the bricks, and having a flue leading into a chimney. This may be rigged up in any room where from ten to fifteen feet of chimney is available. If the room is boarded, you must support the furnace on sheet iron, carried upon bricks. For the fire use ordinary gas coke, though better results are obtained by the employment of hard furnace coke, which costs double or treble the price. You can obtain crucibles of the Morgan Crucible Company, Battersea, of any capacity to suit your requirements, at a trifle over a penny per pound capacity. After the metal is in the crucible and the lid put on, the fire is made up several inches above the crucible, and generally by the time the fire is burnt thoroughly clear, the brass will be found to be melted. I should mention that new crucibles ought always to be annealed before the first time of using, otherwise they are likely to crack. As regards sand, the best advice I can give is to purchase some ready mixed of a friendly founder, and as regards the art of moulding, try and get a moulder for a consideration to come and give you a lesson or two in the methods of ramming, venting, gating, and finishing moulds; practice will do the rest.—J.

Horse-Power of Steam Engine.—IGNORAMUS.—Nominal horse-power is a commercial term by which engines are sold, depending on the size of the cylinder, but not on the power exerted; some engines will work up to five times their nominal h.-p. The term is most misleading, and is being gradually dropped. There is no difference in the power of portable and stationary engines, provided the speed, pressure, and size of cylinders are the same. An engine with two cylinders will exert twice the power as if it had but one of the cylinders. Now for your principal question. You can only obtain the mean pressure on an engine piston by using an indicator to take a diagram, first from one end of the cylinder, and then from the other, and this is the only accurate way of obtaining the power exerted by the steam in the cylinder. Even then you would not have the power the engine was giving out, because some of the "indicated horse-power" is taken up to drive the engine itself. The actual power the engine is giving out can be measured by a dynamometer or friction brake, and the difference between the two is the loss by friction. You can estimate this loss roughly by trying what pressure is required to drive *the engine alone* at its proper speed. You may get something like the average pressure in the cylinder if you know the point of cut-off, and what is the back pressure at the exhaust. For instance, take your engine, and I will suppose it has a common slide valve which cannot cut off till nearly the end of the stroke; then we will suppose it takes 5 lbs. pressure to force the steam through the steam-pipe and passages, and 5 lbs more to run the engine alone. We may then take the mean pressure at about 60 lbs., the boiler pressure being 70 lbs. above atmosphere. Now, there are 95 square inches in your 11 in. piston, and since the stroke is 1½ ft., and 200 strokes per minute (for 100 revolutions), we have the piston speed 200 × 1½ = 300 ft. per minute; 60 lbs. × 95 sq. in. = 5,700 lbs. pressure on the piston: multiplying this by 300, we have 1,710,000 foot pounds, and dividing by 33,000, we get nearly 52 *horse-power effective* when the throttle valve is fully open. You will understand the reasons for this when my papers on the Quarter-Horse Engine appear.—F. A. M.

Case Hardening.—J. W. H. (*Bolton*).—The way we case-harden small levers, link motion, etc., is as follows:—A stout cast-iron pot, about 16 in. in diameter and a foot deep, and having a loosely fitting cast-iron cover—the metal throughout being about 1½ in. in thickness—is used. Into this is put the wrought-iron work, entirely surrounded with strips of leather belting, bones, bone-dust, hoofs, and horns, with a little saltpetre or common salt, or ferro-cyanide of potash. The cover is then luted with wet fire-clay. We place this in a boiler-maker's reverberating furnace; if you cannot obtain the use of such a furnace, you could erect a kiln of bricks, and place the pot in that. A good full red heat is all that is necessary. The period of exposure to the heat will be governed entirely by the depth to which you want the hardened zone to penetrate. Speaking very roughly, ten hours of heat will penetrate to a depth of $\frac{1}{10}$ of an inch; an exposure of twenty hours to a depth of about $\frac{1}{10}$ of an inch, and so on. I am speaking now, of course, of the ordinary temperature of a reverberating furnace; with a lesser heat than that a longer duration will be required. On removal from the furnace, throw the contents of the pot into water.—J.

Cartwrighting.—AMATEUR.—Send to Crosby Lockwood & Son, 7, Stationers' Hall Court, E.C., for their list of Handybooks for Handicrafts, and you may find help on joinery and cabinet-making from some of them. As to cartwright work, I do not know of anything I can, with confidence, recommend you. You may get sheets of designs of vehicles of all descriptions from Gadsdon's, Brushfield Street, E., or Callow's, Pembroke Street, N., and if you wish to know how to construct anything on those sheets, I will willingly do all in my power to help you. "I guess," as our American cousins say, you have not taken WORK long; if so, by referring back, you will find a Battlesden car, a wheelmaking frame, a wheelbarrow, and a plain donkey-cart has already been dealt with, and some instructions about a waggon have appeared in "Shop," page 742, Vol. II.—WORKER BEE.

Cutting Out and Making Up Harness.—S.B.C. (*Derby*).—There is no book published on the cutting out and making up of harness. The *Saddlers' Gazette*, 46, Cannon Street, E.C., some years back had articles on the subject. Harness-making, as a trade, is made up of two or more crafts, the same

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as saddle-making. The two best trade journals are *Harness Gazette*, Troy, New York, and *Harness*, New York.—J. C. K.

Phonograph.—NOGMAN.—Look up the back numbers of WORK, and you will get a lot of information which will be useful to you. The diameter of your brass cylinder is very small, and the speed, once a minute, would never do; you will require to drive it very much faster. I should say that once a second would be nearer the mark—perhaps that is what you mean. The composition of the wax cylinder has been given quite recently—please look it up. The needle may be mounted on a small piece of light wood or cork, and glued to the diaphragm. The mouthpiece of a speaking-tube could be used with advantage: the large funnel you have made will do very well. I could not well give a sketch of diaphragm and needle to suit you, unless I knew something about the other parts of your machine. An ordinary sewing machine can be used; make the point chisel-shaped, and of such an angle as will not cut away the wax too much.—W. D.

Beam Engine.—LEARNER.—You have not given the initial steam pressure among your data. If you will let me have that, I will work out your cards, and give method and result.—J.

Sheets of German Silver.—B. (*Dundee*).—Barker & Allen, 16, Oozell's Street North, Birmingham, for sheets. I do not know about watch-key castings. You might get what you want of W. Smith, 72, Northwood Street, Birmingham, or of Timmins Bros., 42, Lower Loveday Street.—J.

Tempering Chisels.—M. W. (*Bradford*).—Harden at a red heat; let down to a plum colour, and quench in water.—J.

Left-Hand Threads.—WULFRUNA.—You wish to cut a left-hand screw in a chuck, and you have no reversing gear to your lead-screw. Well, you do not need any. All you want is to have your lead-screw revolve in the *opposite* direction to the mandrel, and then the screw you cut will have a pitch in the *opposite* direction to that of the lead-screw. If you connect a change-wheel on mandrel with a wheel on the lead-screw, you have two centres of revolution, and the motion is reversed: if you interpose one intermediate stud, you then have three centres of revolution, and the mandrel and lead-screw revolve the same way when you get right-hand screws, if the lead-screw is right-hand; if you interpose a second stud, a wheel on that gives you four centres of revolution, and mandrel and lead-screw revolve opposite ways. Thus, if number of centres of revolution are even, you get motion reversed, and pitch in opposite direction to that of lead-screw; if centres of revolution are odd, you get motion in the same direction, and pitch same way as in lead-screw. As lead-screw is pretty sure to be right-hand, we may say for the sake of simplicity: Two wheel centres give left-hand pitch, three wheel centres give right-hand, four wheel centres left-hand. Now you will see that all you have to do when you have arranged for the right-hand screw of the correct pitch, is to put in another stud with a small wheel (of no matter what size), called an "idle" or "reversing" wheel, on it. You need not regret the absence of reversing gear; it is more useful for reversing the feed in turning than in screw-cutting, and there are those who would rather be without the extra complication.—F. A. M.

Balloon.—(*No Address*).—The writer asks the size of a balloon that will elevate from 1¼ lbs. to 2 lbs. to the height of two miles, and what light (not the electric light) could be used that should be exceedingly brilliant. I have never experimented with a gas balloon, but a short time since I sent up one with a lifting power of about 1 lb., or perhaps 1¼ lb. This was about 7 feet in its longest diameter. I would like to ask what guarantee is there, in the very likely event of an accident to such a small affair, that the 2 lbs. weight of matter falling should not be the occasion of a coroner's inquest. Think of 1 lb. falling two miles! I am afraid my friend is proposing an experiment in which there is great risk—that is, supposing it ever takes place. Now with reference to the light. The magnesium is the nearest approach in intensity to the electric light, the only drawback being its disposition to go out. There is one point on which the inquirer has said nothing. What is to be the use of the appliance, and has he considered the cost? If it is intended as a toy for amusement, I am afraid that, unless he has a long purse, he will find the experiment, to say the least, disheartening. The balloon must be of silk. Owing to the rarity of the atmosphere at two miles, the internal pressure of gas would be such as to burst mere paper—indeed, I am afraid long before it reached the height indicated there would be very little gas left. Then a self-acting lamp would be required for the magnesium ribbon, which would be rather expensive. Such an arrangement for military surveying purposes would pay; but if for amusement—well, one would have to pay too much for his whistle, apart from the danger of a body weighing one or two pounds falling from such a height. Take Punch's advice, "don't."—O. B.

Hardness of Water.—S. W. K. S. (*Shaftesbury*).—The hardness of water is usually estimated by Dr. Clark's method, which consists in adding a solution of soap of known strength to a measured quantity of the water until a permanent lather is formed. Seventy cubic centimetres (c.c.) of the water are put into a stoppered bottle, and the standard soap solution is added gradually by means of a burette. After each addition of the soap solution, the bottle containing the water is well shaken, and the point noted when a lather forms capable of persisting for, say, five minutes. The number of c.c. of the soap solution used is read off from the burette, and indicates directly the number of degrees of hardness of the water. The standard soap solution is prepared by dissolving 10 grammes of Castile soap in a litre (1,000 c.c.) of weak alcohol, of about 35 per cent. in strength. One c.c. of this solution represents one degree of hardness. This method is very easily carried out, and requires but few apparatus, which will only cost two or three shillings. For fuller information write again, or read Wanklyn's "Water Analysis," published by Trübner and Co., Ludgate Hill, for, I believe, 5s.—F. B. C.

Writing Table.—CLERK.—The height from the ground to the top of the table proper should not exceed 28 in., and don't extend the back pigeon-hole cupboard higher than 20 in.—*i.e.*, about 3 in. depth for bottom drawers, 8 in. for lower pigeon-holes, 6 in. for middle row of the latter, and 2 in. for topmost ones, and the whole should be about 4½ in. inside, from back to front. The table you should have 3 ft. long and 20 in. wide, with a drawer about 4 in. or 5 in. deep. Adopt the use of two side doors and a falling middle flap, the latter to be used as a writing slab. If the pigeon-holes are about 2 ft. or 2 ft. 6 in. in length, and my other dimensions are adhered to, the writing flap will be about 16½ in. long and 14 in. wide, and its upper edge will fall nearly against the front edge of the table, and require no further adjusting or support. On the inside of the side doors use glued racks to accommodate pens, pencils, etc., and tape tacked

Writing Table. The Writing Flap shuts upwards as a Door, while upon the Insides of Doors are Pen Racks, etc.

crosswise to secure loose papers occasionally. The racks need consist of nothing more than an upper piece pierced with holes, and a lower one at a slight angle enclosed by two end pieces. If the doors interfere with the light, discard them; but they will be useful and will add a pleasing appearance to the table. Mr. Adamson's "Some Lessons from an Old Bureau" will afford instructions how to construct pigeon-holes, drawers, etc. Have the writing flap made as one complete solid board. You could have the flap to extend the whole length of the table, but the present method is the best, as the space immediately underneath it could be utilised. The top case sides must exceed in width the pigeon-hole divisions to allow the doors to be fitted.—J. S.

Violin Varnish.—H. A. T. (*Padiham*).—The best way to take off the old varnish is with methylated spirit; after which the instrument should be well sand-papered, beginning with No. 1, and using Fine 0 for finishing.—B.

Steel Furnace.—C. S. (*Caithness*).—You will require a reverberating furnace in which to place your melting crucibles. I suppose you only intend to melt and cast refined steel. If you wish to *make* the steel, it is a different thing. If you will send full particulars and the space available, I will give you a description of the plant you will require and method of working it. Let me know whether it is for steel castings only or for making ingots to be wrought under the hammer. I do not see what you want an annealing kiln for.—F. C.

Worm Hole in Violin Wood.—S. D. (*Sheffield*).—I should not advise you to use the "stopping" you suggest. You had better cut the bad piece out, and let a piece in its place to match the grain as nearly as possible.—B.

Mitre Planing.—DUNCOMBE.—There is, as you think, a special plane for shooting mitres, though its use is not imperative. A new jack plane with the mouth aperture neat and small, and the iron perfectly square, sharpened well on a flat oilstone, would do; the edges of the plane *must* be square with the face. I need scarcely remind DUNCOMBE that these conditions are not likely always to obtain, if the jack plane is used for ordinary purposes. The plane used by picture-frame joiners is a straight block plane, having a wide iron, which lies on the flat surface when in its place, consequently the bevelled sharpened surface is uppermost, and its angle variable. A difference in the angle at which the plane iron is sharpened makes a difference in the cutting angle, and not (as in the ordinary planes) in the clearance behind cutter. The cutter has no cap iron, and being supported to the very edge by the wood of the plane, there is no vibration if the wedge fits well, and therefore less liability to chip the surface of the moulding. DUNCOMBE can get a suitable plane from any good tool shop. The best lesson I can give is to ask him to read J. H.'s articles in WORK on Planes.—B. A. B.

Enamel Inlay.—TINY TIM.—You want to know of some composition or enamel suitable for filling in pearl or ivory after etching or engraving, to represent inlaying in colours, the usual thing, heel-ball, being unsuitable, as would be, I presume, a composition of white wax—powdered colour, and perhaps a little tallow. The next sort of filling would be something made with dry colour and varnish. These should be rubbed up or ground up together, after the style of Aspinall's enamel. How would those preparations do, if thickened by the addition of some more dry colour? Failing that kind of thing, I hardly know what to suggest, unless sealing-wax would meet the case. Japanning could be used for the mother-of-pearl, but I should certainly not risk heating the ivory. The general filling being either heel-ball or the mixture of wax and colour, it is evident that if anything more suitable for general purposes had appeared, the engravers would certainly have used it. The other things I have used to botch up enamel work sometimes: that is why I give them here.—H. S. G.

Tinning Silver Spouts.—H. S. G. (*Battersea*).—(1) Here are two recipes for a composition for protecting one surface of metal whilst the other is being tinned. Take a piece of common glue, about 1 oz., and dissolve it in a gill of water and add a few drops of vinegar; take one table-spoonful of whiting, and about a quarter that quantity of salt; mix them well together dry, and then make into a thick paste with the glue water. Apply it to the articles with a brush, so that it is properly covered; dry with heat before attempting to tin. The composition will come off very easily with hot water. (2) Take a lump of drop-black the size of a walnut and pound it up fine; mix to the consistency of cream with gold size and add a few drops of turpentine. Coat as above, but let it dry of itself for an hour. This is just as good as the white composition for its protective qualities, but it is more trouble to clean off.—R. A.

Cement for Aquarium.—B. A. W. (*No Address*).—It will depend upon the material you use for rockwork as to the cement most suitable. You can make very natural-looking rockwork with pieces of coke dipped in a thin batter of Portland cement, and stuck together roughly with the same cement used thicker. Virgin cork, clinkers, pieces of stone, real rock, etc., may be fastened together with a cement made of pitch, three parts, gutta-percha, one part, melted over a gentle heat with sufficient turps to reduce it to a suitable consistency. This is a very useful cement for a variety of purposes.—C. M. W.

Wire Thread Fret Saws.—D. D. (*Aberdeen*).—With reference to my remarks to you (see page 700, Vol. II.) I have now to add that the theory I then hazarded seems to receive confirmation from the following letter addressed to me by Messrs. Moseley and Son, to whom I sent your letter. They write:—"In reply to yours, we cannot understand the cause of the enclosed letter being sent. We have thousands of catalogues and grains of wire saws which we can despatch at a minute's notice, and only too glad to do so. The writer could not have sent his own address, or he would have had his reply by return. I thank you for the enclosed."

Sawing.—J. R. (*Helmshore*).—If there is but little difference in the gauge of your saws, the 36 in. saw would do the work you mention easier than the 27 in. saw, if spindle in both cases runs at the same speed, as the speed at the point of teeth in the 36 in. saw would be much faster than in the 27 in. saw. But should both saws be driven from 8,000 to 9,000 ft. per minute at the point of teeth, which should be the speed for the work you mention, the 27 in. saw would do the work with much less power than the 36 in. saw, especially if the gauge of saws corresponds with the diameter, and the timber is not more than 7 in. deep, which is less than one-third the diameter of saw. When the timber is above one-third the diameter of saw, the saw is overcrowded, and it may be sawn easier with a little larger saw. You will understand that saws of the right gauge and speed will cut timber one-third their diameter with less power than saws of greater diameter. If a saw is driven much below its speed, and the feed of timber is as fast as when a saw is driven its proper speed, there will be greater strain on the saw-plate, and it soon becomes crippled, and unless the belt is tight it will slip. Consequently, more power will be required, and the work done will be inferior.—A. R.

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III.—Questions Submitted to Correspondents.

Mitre Shoot.—J. J. D. (*Dowlais*) writes:—"Will any reader let me know where I can get Hodge's mitre shoot? I have sent to the holder of the patent right, Mr. E. R. Sibley, White's Hill, near Stroud, Gloucestershire, but he has gone away, and I don't know where I can get one, and the price of it."

Violin Materials.—J. E. (*Chatham*) writes:—"Can any reader kindly say where I can buy violin-making tools and materials? I shall also be glad of any information respecting books on same."

Prices in Sign-Writing.—A Constant Reader will thank anyone for the prices for sign-writing on wood, glass, and metal letters, embossing, and glass-writing, in London and provinces respectively.

Calico Designs.—J. T. (*Seedley*) will be obliged to any reader who will give him hints and suggestions towards designs for calico.

IV.—Questions Answered by Correspondents.

Violin Mute.—M. (*Bishop Auckland*) writes, in reply to Violin (see page 650, Vol. II.):—"This is made of three pieces of sheet brass, 1/8 in. thick, soldered or riveted together (see Fig. 1); the oval is cut in the two outside pieces, the holes drilled in

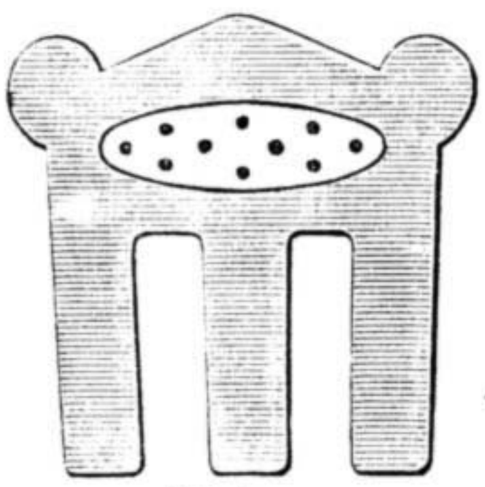


Fig. 1.

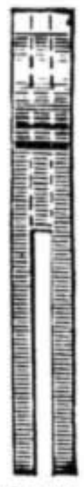


Fig. 2.

Fig. 1.—Violin Mute (full size).

Fig. 2.—Section of Violin Mute (full size).

Fig. 3.—Cardboard Mute.

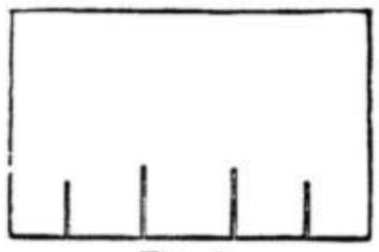


Fig. 3.

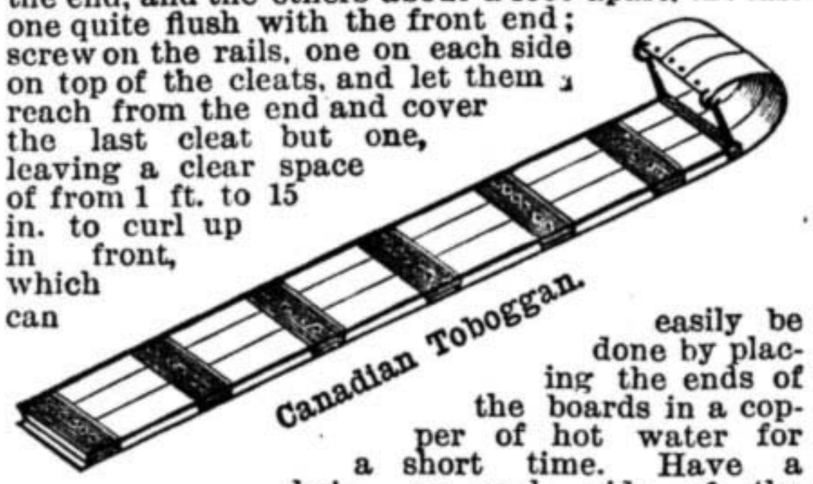
the middle piece, which stops at the top of the notches (see Fig. 2). It is set on the bridge. Or you may make a temporary mute by cutting four notches in a card, and fixing it on the strings close to and above the bridge (see Fig. 3), the card to be about twice as thick as a visiting card."

Banjo.—R. H. H. (*Shutter Oak*) writes, in reply to W. P. (*Burnley*) (see page 602, Vol. II.):—"If you want a banjo for only playing accompaniments, a seven is best; for solos or thimble playing, a five-string, for the reason that you can finger correct chords on five strings all the way up the finger-board, and either roll or sweep them, as in machette playing. Brewster makes ordinary size banjos, but the Grand Orchestra type are much longer in the finger-board, and consequently chords that require a long stretch are more difficult to stop correctly. Also the ordinary size can be tuned to concert pitch to accompany piano or violin. The long finger-boards will not, as the strings would, be always breaking. It is not generally known that professionals tune these banjos one or even two tones lower, and their orchestral accompaniments have to be transposed to the lower. In England the general custom is to lower G to F, and in America to E. You will see the two general sizes given in Work, No. 83, page 503."

Browning Gun Barrels.—T. W. (*No Address*) writes, in reply to C. B. F. (*Seacombe*) (see page 734, Vol. II.):—"Apply the following to your barrels:—Sulphate of copper, 1 oz.; sulphuric ether, 2 oz.; water, 1 oz. Mix these in a bottle and keep closely corked. Shake well before using."

Frosting.—Northerner writes, in answer to Beta (see page 734, Vol. II.), who inquires how to frost glass:—"I would submit the following: It may not be the orthodox way of doing the work, but it nevertheless produces a good result—at least, on *plate* glass. Get a piece of plate glass, say 4 in., 5 in., or 6 in. square—an old small looking-glass does well—some emery of medium fineness, and a little quantity of elbow grease. Mix the emery to a paste with oil and apply to the glass to be ground, then go over the whole surface in a circular manner with the piece of plate-glass, working it down to the necessary obscurity. It will take some time, perhaps, but here the elbow grease comes in. If it is ordinary window glass, the high positions will come up first, and a longer time will be taken than if it were plate glass that was being ground. In order to hasten the work, Beta might employ rather coarser emery first, but the fine emery must be used to finish off with, or else a mass of scratches will be the result. Finally, go slow, examine work frequently, and adapt means and methods which common sense suggests."

Canadian Toboggan.—J. J. (*Ottawa, Canada*) writes, in answer to W. F. (*Tunbridge Wells*) (see page 552, Vol. II.):—"I think it quite probable that a toboggan could be purchased at one of the ship chandlers in Fenchurch or Bishopsgate Street, London; but if not, W. F. could make one by following the directions here given:—Get three boards 8 ft. long, 6 in. wide, and ¼ in. thick (quartered oak or ash); also some short pieces 18 in. long and 2 in. wide, and two pieces of 1 in. square ash, about 7 ft. long, for rails; lay the boards on the floor parallel and true on the end, and screw one of the short pieces across the end, and the others about a foot apart, the last one quite flush with the front end; screw on the rails, one on each side on top of the cleats, and let them reach from the end and cover the last cleat but one, leaving a clear space of from 1 ft. to 15 in. to curl up in front, which can easily be done by placing the ends of the boards in a copper of hot water for a short time. Have a hole on each side of the main board at the front end through it and the cleat (a ¼ in. hole will do, which should be made about ¾ in. from the front), and have ready two lengths of whipcord, which pass through the hole around the end and around the rail just behind the last cleat that it covers, to keep the curve in its proper shape. The cord will need to be passed through and around a number of times, and finish off by taking half hitches around it, so as to bind it together neatly. The Indians use raw hide thongs for making theirs, but the pale faces are making them with screws here now. W. F. will need a piece of ½ in. rope to haul it up the hill after sliding down."



Canadian Toboggan.

Blackboards.—C. A. P. (*London, N.*) writes, in reply to A. J. L. (*Paddington*) (see page 718, Vol. II.):—"There are several different ways of doing this. A simple plan is to give it a couple of coats of good black paint, with plenty of driers in it, which will dry with a glossy surface; after which, a third coat is given with ivory drop black ground in turpentine, to which a small quantity of japanner's gold size has been added—just sufficient to cause it to dry with a good flat or dead black, each coat being allowed to become thoroughly dry before the next is applied. Another method is to give the board a couple of coats of black mixed with boiled oil and driers, smoothing it when dry with flour paper, and afterwards giving it another coat of black with turpentine in place of oil. A third plan, which permanently stains the board, consists in first brushing it over with a solution of sulphate of iron, and allowing this to soak into the wood, and then sponging it with a solution of galls until the desired depth of black has been obtained."

Browning Gun Barrels.—C. A. P. (*London, N.*) writes, in reply to C. B. X. (*Seacombe*) (see page 734, Vol. II.):—"First make the barrels perfectly clean and entirely free from grease by rubbing them with powdered quicklime and water; then prepare the following:—Sulphate of copper, 2 oz.; perchloride of iron, ½ oz.; sweet spirits of nitre, ½ oz.; aquafortis, ½ oz.; and water, 40 oz. The sulphate is first dissolved in the water by the aid of heat, after which the other ingredients are added as soon as the solution has become cold. It is then applied to the barrels, and allowed to remain for twenty-four hours, when the barrels are brushed with a stiff brush, and afterwards polished by means of a piece of smooth hard wood, and finally protected by a varnish composed of gum shellac, 1 oz., spirits of wine, 2 pints, the barrels being heated previous to the application of the varnish."

Preserving Rabbit Skins.—E. H. H. (*New Brompton*) writes, in answer to Idem Sonantia (see No. 91, page 634):—"I have preserved them by simply stretching and tacking them fur downward on a board, and scraping all superfluous fat, etc., away, and pasting with two or three coats of alum and water. I did some for footstools, etc., four or five years ago, and except for wear, they are all right."

V.—Brief Acknowledgments.

Questions have been received from the following correspondents, and answers only await space in Shop, upon which there is great pressure:—Anxious; Britannia Co.; O. B. R. (*New York, U.S.A.*); W. S. (*Inverness*); R.M.; J. M. (*London, S.W.*); H. G. (*Coventry*); Constant Reader; F. V.; Constant Reader; Z. L. (*Newhaven*); B. J. H. (*Dorking*); H. F. F. (*Hackney, E.*); Falero; J M. (*Manchester*); A Subscriber; Well-wisher of "Work"; G. J. W. (*Ballymena*); J. F. (*Hyde*); T. B. (*Dodworth*); J. S. (*Ipswich*); H. W. (*Addlestone*); W. M. (*Plaistow*); J. H. W. (*Chatham*); H. P. (*Brighton*); H. W. C. (*London, S.E.*); J. S. B.; Earnest Reader; R. J. (*Rawtenstall*); Mac; W. J. P. (*Congleton*); Workite; Holly Reader; D. (*Sunderland*); Label; D. H. (*North Shields*); Index; S. J. (*Compstall*); Electric; J. B. (*Poplar, E.*); X. M. T. C. C. (*Derby*); W. L. (*Kingsland*); A. B. (*Accrington*); D. W. K. (*Dumfries, N.B.*); G. E. B.; J. K. (*Bury*); Electro; J. A. (*Sheffield*); W. A. P.; J. W. (*Belfast*); Tuner; Spot Stroke; A. H. (*Stratford, E.*); J. S. (*Bath*); Benedict; J. S. (*London, N.*); Auxiliary; Olrac; Turbine (*Preston*); K., Old Subscriber; No. 305; Terra-Cotta; T. U. (*Manchester*); Trefaldwyn; B. W.; A. D. (*New Cross, S.E.*); H. B. S. (*Liverpool*); Amateur; Anxious Inquirer; Steam Engine; One in Trouble; Novocastren; Reader from the First; Puzzled; Joint; A Very Old Subscriber; W. K. S. (*Liverpool*); J. R. P. (*Stafford*); Ironsides; J. S. G. (*Norwich*).

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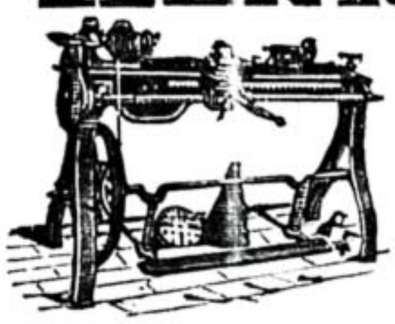

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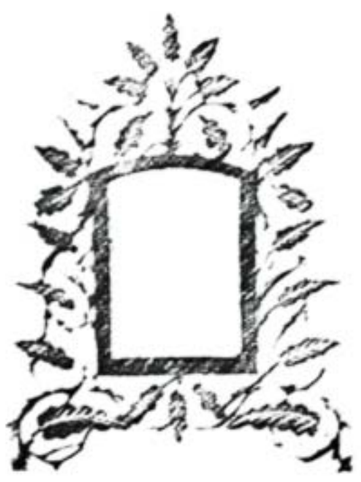

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